More than just a black-board: Cash transfers and adolescent education in South Africa

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SALDRU Working Paper Series Number 125, Version 2

NIDS Discussion Paper 2013/7

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Recommended citation
Eyal, K., Woolard, I., Burns, J. (2018). More than just a black-board: Cash transfers and adolescent education in South Africa. Cape Town: SALDRU, UCT. (SALDRU Working Paper Number 125, Version 2/ NIDS Discussion Paper 2013/7).

ISBN: 978-1-920517-66-3

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University of Cape Town
August 2018

Abstract

Cash transfers are a well-known tool in the developing world to alleviate poverty. However, much of the research evaluating these programs has focussed on short term outcomes, in populations of younger children. Using exogenous changes in the age eligibility limit of an unconditional cash transfer to South African children, this paper examines the current and cumulative impact of grant receipt on the educational outcomes of older adolescents. We find that while current grant receipt raises enrolment rates, longer exposure to this cash transfer does not predict higher years of education attained, or other similar measures of cumulative attainment. This finding emphasises the crucial nature of school quality for educational attainment - a hypothesis that the data supports. It is clear that education is a function of more than just a blackboard - quality of school matters too.

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1 Introduction

To improve child and adult outcomes, many developing countries have introduced social support systems (Adato, de la Briere, Mindek & Quisumbing 2000, Filmer & Schady 2011, Baird, McIntosh & Özler 2009, De Brauw & Hoddinott 2011), often implemented with the specific aim of improving educational outcomes, with receipt conditioned explicitly on school enrolment (Baird, Ferreira, Özler & Woolcock 2014). Some of these systems have been in existence for sufficient time that their first beneficiaries are now entering adulthood. Many favourable program effects have been found for both households and children in particular, on poverty, education, nutrition, health, cognition, and others (Adato & Bassett 2009, Adato et al. 2000, Baird, Chirwa, De Hoop & Özler 2014, Attanasio & Lechene 2002, Nores & Barnett 2010), particularly for women and girl children (Baird, Chirwa, De Hoop & Özler 2014, Amarante, Ferrando & Vigorito 2011).

Along with these countries, South Africa implemented a cash transfer system, consisting of old age pensions, foster, disability and child support grants, intended to help its poorest citizens (Department of Social Development 2011). This system has grown considerably - in 2010 3.5 percent of gross domestic product was spent on social support (Woolard & Leibbrandt 2010), with the child support grant having the largest number of beneficiaries[1] (Woolard, Buthelezi & Bertsher 2012).

Introduced in April 1998 following the 1996 Lund Commission, the child support grant is distributed to South African children subject to age and means test limits (Heinrich, Hoddinott & Samson 2012, Department of Social Development 2012), and initially aimed to cover children in the poorest thirty percent of households (Aguero, Carter & Woolard 2006). The grant was intended to reduce racial and gender income inequality, effectively target poor children no matter their household status, and improve nutrition in the critical early years of childhood (Lund 2008).

The South African grants system has been shown to reduce poverty in households (Samson, Lee, Ndlebe, Gandhi, Harigaya, Abrahams, Quene & Niekerk 2004, Triegaardt 2005, Leibbrandt, Woolard, Finn, Argent et al. 2010). A positive relationship between grant receipt and child outcomes has also been established, especially outcomes such as nutrition and development (Budlender, Burns & Woolard 2008, Samson, Heinrich,

[1] As in much of the literature which evaluates the impact of the child support grant, adult caregivers who receive the grant on behalf of children will be referred to as CSG recipients, while the children for whom the grant is intended will be referred to as CSG beneficiaries.

Williams, Kaniki, Muzondo, Mac Quene & Van Niekerk 2008, Williams 2007, Aguero, Carter & Woolard 2009, Budlender & Woolard 2006, Hochfeld 2013, Boler 2007, Samson et al. 2004, Department of Social Development 2012). All of these results are crucial for educational attainment

The majority of the literature on the effect of social support systems has focussed on younger children, leaving the outcomes of adolescents and their mothers largely unexamined (Amarante et al. 2011, Baez & Camacho 2011, Behrman, Parker & Todd 2011, Nores & Barnett 2010). In addition, often only short term outcomes are assessed, such as school attendance, or physical health (Saavedra & Garcia 2013, Barham, Macours & Maluccio 2013, Baird, Ferreira, Özler & Woolcock 2014), with little focus on the cumulative effects of cash transfers (Saavedra & Garcia 2013, Barham et al. 2013, Baird, Ferreira, Özler & Woolcock 2014). While general agreement exists in the literature of the benefit of early intervention for child development (Nores & Barnett 2010), whether these benefits have been sustained in the long term is unclear. Short term evaluations of cash transfers often take place in the form of randomised controlled trials (RCT) (Baird, Ferreira, Özler & Woolcock 2014), which may suffer from a lack of generalisability due to small samples and attrition (Kilburn, Thirumurthy, Halpern, Pettifor & Handa 2015). For economic reasons, program effects in these trials tend to be evaluated for only a short duration after the initial intervention (Baird, Ferreira, Özler & Woolcock 2014).

This paper seeks to bridge some of the gaps in this limited body of literature, through an evaluation of the effect of the South African child support grant on the educational outcomes of older adolescents, a group neglected in the existing cash transfer research (Baird, McIntosh & Özler 2011, Chhagan, Mellins, Kauchali, Craib, Taylor, Kvalsvig & Davidson 2014, Ozer, Fernald, Weber, Flynn & VanderWeele 2011). Access to the grant changed in a non-systematic way, with unanticipated extensions in both the age-limit and the means test threshold over the years. This pattern of roll-out created exogenous variation in grant receipt, which we use to identify the impact of the grant on both enrolment, which may be related to current CSG receipt, and educational attainment, which is more likely to be related to cumulative years of exposure to the grant.

We find that current CSG receipt in older teens has a positive and large impact on school enrolment, as does the cumulative duration of receipt. CSG beneficiaries have enrolment rates a minimum of ten percent higher than non-beneficiaries, which is a sub-

stantial increase given the pre-existing high rates of enrolment among older South African teens of eighty-one percent. An extra ten years of receipt can raise enrolment rates by more than fifteen percent. However, years of schooling achieved among older teens who receive the grant are not significantly different to those who do not. In addition, longer potential duration of receipt is not associated with any increase in human capital achievement in adolescents.

This paper is organised as follows. Section 2 presents literature on cash transfers and educational outcomes. Section 3 presents a theoretical framework for educational attainment and enrolment. Section 4 details the specific roll-out of the child support grant, and Section 5 presents a preliminary data investigation. Section 6 presents estimates of the impact of the child support grant on educational outcomes. Section 7 places these results in context and discusses potential mechanisms of change, and Section 8 concludes.

2 Literature Review

2.1 Post Apartheid Life for South African Children

That extra income could prove meaningful to South African households is not in doubt. A large proportion of South Africa's children grow up in extreme circumstances, with exceptionally unfavourable living conditions and limited access to health care and education (Budlender & Lund 2011). More than a quarter of children in 2010 did not have adequate housing, water or sanitation (Hall & Woolard 2012). High levels of unemployment and poverty are common in the population (Case & Deaton 1998, Klasen & Woolard 2009), as well as particularly high levels of inequality (Blas & Kurup 2010). Using a conservative poverty measure, sixty percent of South Africa's children could be classified as poor in 2010 (Hall & Woolard 2012). African incomes are substantially smaller than those of White individuals, due in no small part to the policies of the government in power prior to 1994(Case & Deaton 1998). Three generation or "skip" generation[2] households are frequently observed in the population (Djebbari & Mayrand 2011), and often these households are supported by a single state pension (Duflo 2003, Case & Deaton 1998).

As a legacy of apartheid policies, migration for the purposes of job search is common

[2]These are households skipping the middle generation: missing mothers and fathers, and containing only children and grandparents.

(Klasen & Woolard 2009, Case & Deaton 1998), and the effects of this migration are seen in the fact that children in up to half of all households do not have a father present (Djebbari & Mayrand 2011), and a third of children do not live in a household with a wage earner (Altman, Mokomane & Wright 2014). High levels of tuberculosis and HIV are prevalent in the population (Hall & Woolard 2012), and the HIV/AIDS epidemic has resulted in high rates of orphanhood and fostering in the population (Case & Ardington 2006, Djebbari & Mayrand 2011).

These adverse conditions impact on a number of key child outcomes, including nutritional status (Ardington & Case 2009), education (Branson, Lam & Zuze 2012), and mental health (Ardington & Case 2010), to name a few. Seventeen percent of children live in households where they sometimes or regularly go hungry (Altman et al. 2014). More than a third of sixteen to seventeen-year-olds have not completed grade nine, and grade repetition is common (Branson et al. 2012). More than half of the youth population between the ages of eighteen and twenty-four are unemployed or out of the labour force, and are not enrolled in school or tertiary education (Altman et al. 2014). A large proportion of youth (thirty-eight percent) who leave school cite lack of funds to continue as the major reason for their departure (Altman et al. 2014). More than fifteen percent of teens are depressed, and this depression is seen in conjunction with higher levels of risky behaviour and worsened educational attainment (Myer, Stein, Jackson, Herman, Seedat & Williams 2009).

Households receiving the child support grant are also found to live in unfavourable circumstances. These household are larger, more likely to be situated outside of urban areas, and to have lower household income (Case, Hosegood & Lund 2005), despite reporting receipt of other government grants (Patel 2012, Department of Social Development 2012). Members of these households have lower levels of education and employment, and correspondingly fewer assets (Department of Social Development 2012, Budlender et al. 2008, Aguero et al. 2009, Hunter & Adato 2007, Delany 2008). Recipients tend to be African women, a group with particularly low income levels (Delany 2008).

Woolard & Leibbrandt (2010) estimate that in the absence of government grants, the depth of extreme poverty in households would increase two-fold. The depth of need is shown in the high levels of take-up: in 2010, sixty-two percent of age eligible children were receiving the grant (Woolard et al. 2012), and this figure is expected to continue to

rise (Woolard & Leibbrandt 2010).

2.2 Cash Transfers and Education

Unconditional cash transfer programs like the child support grant are common in African countries (Baird, Ferreira, Özler & Woolcock 2014). Outcomes have been seen to differ substantially depending on the type of grant - conditional or unconditional (Baird, Ferreira, Özler & Woolcock 2014, Paxson & Schady 2010). In many programs receipt is conditioned on proof of school enrolment of the beneficiary. Conditional programs with very strict conditions and effective monitoring have shown much larger effects in school enrolment and attendance (De Janvry, Finan, Sadoulet & Vakis 2006, Baird, Ferreira, Özler & Woolcock 2014, Amarante et al. 2011). However, very little effect on test scores and years of schooling attained has been observed (Wolf, Aber & Morris 2013).

Many studies exist which examine the impact of transfers on enrolment in particular, in countries such as Brazil, Pakistan, Columbia, Mexico, Ecuador and others (Baird, Ferreira, Özler & Woolcock 2014, Adato et al. 2000, Filmer & Schady 2011, Baird et al. 2009, De Brauw & Hoddinott 2011, Schady & Araujo 2006). In a randomised experiment in Ecuador, cash transfers are estimated to increase school attendance by ten percentage points (Schady & Araujo 2006), which is considered a large effect. In Mexico, conditional cash transfer programs have been found to be more effective than unconditional programs at improving enrolment, especially at the transition to lower secondary school (De Brauw & Hoddinott 2011). Even a very modest cash transfer can raise enrolment rates substantially, as observed in Cambodia (Filmer & Schady 2011).

Turning to older teens, one finds a more limited literature. In a randomised controlled trial with a sample of older Malawian teenagers, Baird et al. (2011) find that cash transfers can be successful at preventing school drop-out and teen marriage and pregnancy (a key issue which impacts school attendance). In Columbia, conditional cash transfers have been associated with higher rates of enrolment for teenagers (Barrera-Osorio, Bertrand, Linden & Perez-Calle 2011), and similar results are found in Mexico and Brazil, with additional effects of higher educational attainment for those with longer exposure to cash transfer programs (Behrman, Parker & Todd 2009, Schaffland 2014). No such effects have been found in teens in Uruguay however (Amarante et al. 2011).

The South African education system requires children to begin school in the year they

turn seven, and allows exit from school in the year a child turns fifteen, or reaches the ninth grade, whichever comes first (Fleisch, Shindler & Perry 2012). Unlike many other developing countries, South Africa does not suffer from low levels of enrolment at the primary school levels, with very high levels of enrolment observed until children reach the legal school leaving age of fifteen (Case & Deaton 1999). Thereafter more variability in school enrolment is present.

Although the child support grant has been associated with increased grade repetition in younger children, some positive effects of receipt on attendance or enrolment have been found, even for co-resident non-recipient children (Budlender & Woolard 2006, Fleisch et al. 2012). In KwaZulu-Natal, a large province of South Africa, neither pension nor CSG receipt have been found to affect primary school completion rates (Boler 2007), although CSG receipt can mitigate or entirely cancel out the negative effect of being an orphan on educational outcomes (Boler 2007, Case & Ardington 2006, Timaeus & Boler 2007). A survey by the Department of Social Development in 2012 observed an association between grant receipt and lower absenteeism among adolescent boys (Department of Social Development 2012).

To further understand the mechanisms by which cash transfers may affect schooling outcomes, we present a theoretical framework of educational attainment in Section 3

3 Theoretical Framework

As in other countries which record high enrolment at the primary level, examining the impact of receipt on primary school enrolment in South Africa is not a meaningful exercise, unless it is at the very young ages of six or seven where some slight delays in enrolment are observed (Adato & Bassett 2012, Case & Deaton 1999). The analysis in this paper differs from much of the cash transfer and schooling literature, with a focus on enrolment and educational achievement among older adolescents, and not at the primary school level (Rawlings & Rubio 2005). It is important to remember that the enrolment discussion in younger children is usually centered on bringing children *to* school to enrol, while with adolescents, the focus is on preventing them from *leaving* school, once enrolled.

The literature on education shows that the determinants of schooling performance in South African and internationally are many and varied. Important school level de-

terminants are school quality, distance to school, pupil teacher ratios, no fee status, class size, and the age distribution of one's peers (Cascio & Schanzenbach 2007, Angrist & Lavy 1999). Individual determinants include gender, race, household socio-economic status, the cost of school fees, uniforms and books, parental educational achievements, home language and proficiency in English, household size and expenditure, rural or urban location and province (Case & Deaton 1999, van der Berg 2008, Lam, Ardington & Leibbrandt 2011). Around the world, an inability to meet schooling costs is associated with drop-out, particularly in developing countries (Baird, Ferreira, Özler & Woolcock 2014, Naong 2013), and South Africa is no exception (Altman et al. 2014). Other less frequently cited factors in enrolment include being born in a foreign country, orphanhood, domestic migration, and disability status (Fleisch et al. 2012, Case & Ardington 2006), and physical and mental health (Fleisch et al. 2012, Baird, De Hoop & Özler 2013).

Adolescent enrolment reflects the preferences of parents *and* children. After the minimum school leaving age is reached, enrolment becomes a choice. The decision to enrol can be viewed as either a current consumption decision, or an investment decision. The investment decision compares the net present benefits and costs of education. Investment takes place if the expected rate of return is greater than some available rate of interest (Becker 1964, Campbell & Siegel 1967, Mincer 1958, Mincer & Polacheck 1974). Assuming zero costs to schooling, the individual maximises

$$V_n = a_n \int_n^l (e^{-rt}) dt$$

where t is time in years, a_n are annual earnings, V_n is the present value of life earnings before enrolment, and r is the discount rate (Mincer 1958).

In the consumption framework, education can be regarded as a durable good which gives both current consumption benefits (which are often difficult to measure), and future services. The demand for education Q_d is dependent on a large number of factors.

$$Q_d = f(X_i, HH_h, S_s)$$

The X_i are individual characteristics, such as expected future earnings, education already obtained, motivation, health, innate ability, ethnicity and gender (Schultz 1961, Johnes &

Johnes 2004). The S_s include school characteristics such as the direct costs of schooling[3], school quality and others (Case & Deaton 1999). The HH_h include family characteristics and socio-economic factors (Freeman 1987, Hanushek, Machin & Woessmann 2011). Another determinant of education demand is the level of consumer prices. A rise in consumer prices relative to the costs of education implies the purchase of education for its future benefits is cheaper, and thus an individual would substitute future enrolment for current consumption (Campbell & Siegel 1967).

The opportunity costs of school enrolment are an important consideration[4] of the school attendance decision (Becker 1964). When adolescents do not attend school, they may work on family farms, or in the home (Schultz 1961, Amarante et al. 2011). Their enrolment has an opportunity cost to the family, but which may be difficult to estimate or measure (Campbell & Siegel 1967). These costs are proportional to the number of years of school already attained (Freeman 1987), but the anticipated benefits of enrolment rise the closer the individual is to school completion[5]. In both the investment and consumption models, cash transfers, by lowering the direct, and indirect (opportunity) costs of education (compared to an alternative investment, or wage income), imply an increased demand for education (Hochfeld 2013).

The demand for enrolment is a derived demand, stemming from the demand for education (the desire to invest in human capital). Many of the factors which determine educational attainment are also important in the enrolment decision, and may have similar direction effects in both models.

School characteristics (such as cost or quality) clearly cannot enter into enrolment models directly, as those not enrolled have missing data for these variables (although it may be possible to infer some information from the characteristics of schools attended by siblings). Average school quality in the surrounding area may also serve as a proxy for school characteristics (Johnes & Johnes 2004), but this may be a poor proxy depending on the relative importance of household formation and potential migration compared to

[3]Including school fees, books, uniforms, transport and others (Becker 1964). Campbell & Siegel (1967) find that education prices and income levels explain a significantly high proportion of the variation in tertiary education demand in the United States between 1919 and 1964.

[4]A teenager contemplates enrolment or employment, where the prospect of the latter is uncertain. Opportunity costs for teens are lower than that of older workers, given low teen employment rates, and lower expected salaries.

[5]This is observed in South Africa, where the rates of return to education rise steeply after matriculation (Finn, Leibbrandt, Lam et al. 2015).

school characteristics when making the enrolment decision.

A caveat is necessary when estimating enrolment or attainment models. One may have only poor measures of crucial determinants such as ability, family tastes for education, and school characteristics. On balance, including proxies for these variables to prevent omitted variable bias may be better than the possible (due to non-random error) inconsistency, bias and loss of significance associated with measurement error of the true variables, especially if these variables are not the main independent variables of interest (Cohn & Geske 1990). If sufficiently large variation occurs in the true variables, measurement error may be less of a concern. However, if the estimates of variables which are by necessity included in models as proxies do not emerge as significant, it cannot necessarily be concluded that the true variables have no impact on attainment or enrolment (Cohn & Geske 1990).

Educational outcomes can be measured in a variety of ways. These include stock variables such as years of schooling attained, senior certificate attainment, grade progression (including repetition or skipping), and standardised test scores (Case & Deaton 1999, van der Berg 2008, Lam et al. 2011), and short-term measures such as yearly school enrolment or daily attendance (and the reverse, drop-out and days of school missed). The stock variables are cumulative measures, which are by nature path dependent, and reflect the results of early investments, as well as current ones into human capital (Aguero et al. 2006), while the short-term measures are more likely to be influenced by one's current situation, whether financial or otherwise.

We focus on two teen outcomes: current enrolment, and the number of years of schooling attained. Grant receipt enters into the investment and consumption models as a change in income levels, experienced both currently and over time. Although the amount received is not large, at 280 South African rand per month in 2012 (approximately twenty-six US dollars) it may comprise a not insignificant share of household incomes, due to the low average per capita income in South African households (Woolard & Leibbrandt 2010).

We turn to a description of the program implementation details of the child support grant in Section 4.

4 Program Details

4.1 Implementation and Access

The child support grant was introduced in 1998 for all children under the age of seven. Although initial take-up by beneficiaries was very low, it increased substantially from the year 2000 (South African Treasury Report 2011), with more than thirteen million beneficiaries recorded in 2013 (Hochfeld 2013).

Certain administrative issues prevented many from accessing the grant at first, and some of these may persist to the current day, although administrative processes have shown improvement (Hall & Monson 2006). However the time and money costs of application are still a consideration for applicants, particularly if the document requirements are onerous, or the travel costs involved are high (Department of Social Development 2011, Department of Social Development 2012). Potential recipients were often unable to access the grant due to illegal requirements for additional documentation, such as clinic cards, photos, or letters from a child's school, on top of the normal legal requirements (Hall & Monson 2006).

These are all possible reasons for the lower rates of receipt often observed for vulnerable groups such as orphans and foster children (Leibbrandt et al. 2010, McEwen, Kannemeyer & Woolard 2009, Case & Ardington 2006). In addition, exclusion has occurred due to incorrect perceptions regarding the probability of success in application (Department of Social Development 2012, Department of Social Development 2011), and the artificially low means test threshold until 2008 (Budlender, Rosa, Hall et al. 2005).

A number of changes occurred in the amount paid to beneficiaries, the means test amount for caregivers (whether single or married), and the age eligibility limit following the establishment of the grant in 1998 (see Table 1 for details). The age limit has remained constant at age eighteen from the year 2012, while the amount and means test limit have increased with, or above inflation each year (following a correction to the means test level in 2008).

The irregular pattern of extension in the grant resulted in certain children losing receipt having aged out of the system, and then in a following year, becoming age-eligible to receive the grant again, due to another expansion in the age threshold. These individuals thus could have had only interrupted receipt to the grant, if they did receive

Table 1: The Child Support Grant: Age Eligibility, Dates, and Amounts

Year	Month	Amount	Age Limit	Single Caregiver Means Test
1998	October	R 100	7	R 1,100
1999	July	R 100	7	R 1,100
2000	July	R 100	7	R 1,100
2001	July	R 110	7	R 1,100
2002	April	R 130	7	R 1,100
2002	October	R 140	7	R 1,100
2003	April	R 160	9	R 1,100
2004	April	R 170	11	R 1,100
2005	April	R 180	14	R 1,100
2006	April	R 190	14	R 1,100
2007	April	R 200	14	R 1,100
2008	April	R 210	14	R 1,100
2008	October	R 230	14	R 2,300
2009	January	R 240	15	R 2,400
2010	April	R 250	16	R 2,500
2011	April	R 260	17	R 2,600
2012	January	R 280	18	R 2,800
2013	April	R 290	18	R 2,900
2014	April	R 310	18	R 3,100
2014	October	R 320	18	R 3,200
2015	April	R 330	18	R 3,300

This table contains the details of the dates and amounts of the child support grant roll-out over the years since 1998. The age limit referred to is the upper age limit, for e.g. in 2011, children aged sixteen and under could receive the grant. In 2008, the means test was changed to ten times the grant amount, i.e. in 2009 when the monthly grant amount was R240, the means test was R2,400. For married couples, the means test amount is exactly double the single means test level at R4,800 per month. Between 1998 and the beginning of 2008, the means test amount was set at R1,100 in urban areas, and R800 in rural areas. At the end of 2008 an identical threshold was put into place for both rural and urban areas. Beneficiaries received 280 rand per month in 2012, approximately twenty-six US dollars. Original source: National Treasury Reports in Eyal and Burns (2016).

the grant at all. Those born after 1995 have the potential for uninterrupted receipt, and those before have their receipt interrupted with certainty.

4.2 Conditionality

Initially the grant was tied to a number of onerous conditions, including proof of vaccination and participation in various development programs, and the documents showing proof of income or lack thereof (Woolard & Leibbrandt 2010, Department of Social Development 2012). This led to very low take-up in the first year, of under twenty-two thousand beneficiaries. As many of these requirements discriminated against those already in need who lacked access to health care, and other services, the requirements were dropped in 1999 (Heinrich et al. 2012).

When the program began, receipt was not conditioned on school enrolment, due to the existing high levels of enrolment in the South African primary school going population (Heinrich et al. 2012). However, in January 2010, when the age limit changed to 16, grant receipt was formally conditioned on school enrolment, with new applicants being required to bring report cards (where applicable) of children to the Department of Social Development offices on application (Department of Social Development 2012). However, these conditions were not implemented consistently (Patel 2012) and actual discontinuation of receipt was viewed as a last resort (Department of Social Development 2012). Anecdotally, this condition was not applied consistently for existing beneficiaries, only for new younger applicants, who were less likely to be school going age (Department of Social Development 2012).

By 2016, the official conditions by which a child was eligible for the child support grant, as stated by the South African Social Security Agency, did not include proof of school enrolment or attendance (SASSA 2016), and this was possibly due to the high costs of enforcing an enrolment condition (De Brauw & Hoddinott 2011). The perception that receipt is conditional on school enrolment may remain, due to the fact that if the child lacks official identification, the caregiver may submit a number of alternative documents to prove the existence of the child, one of which is a school report card (Department of Social Development 2012).

The shortage of social workers, and the already close to a hundred percent enrolment rates of younger children imply that even if it is being applied at a local level, the school enrolment condition can still be considered a very soft condition (Woolard & Leibbrandt 2010). From an enrolment perspective, the grant has been considered by researchers to be unconditional (Samson et al. 2008, Baird, Ferreira, Özler & Woolcock 2014).

The grant is subject to a means test. The test was initially based on household income, and then on caregiver income (Woolard & Leibbrandt 2010). The means test amount is doubled for married caregivers, and proof is required of non-support from fathers if the recipient reports their status as single (Budlender et al. 2005). In South Africa the costs of administering the means test were estimated to be high, even when excluding the costs of detecting fraudulent receipt (Budlender et al. 2005, Hall & Monson 2006).

We turn to an exploration of the data and the patterns of receipt among older adolescents in Section 5.

5 Methodology

5.1 The National Income Dynamics Survey

This paper uses the first three waves of the South African National Income Dynamics Survey (NIDS), with a special focus on Wave 3 (Brown, Daniels, De Villiers, Leibbrandt & Woolard 2013, SALDRU 2013). In Wave 3 (2012), changes in the age limit of the CSG took place, which can be used to identify the impact of grant receipt in older adolescents.

The NIDS is the first longitudinal survey of its type in South Africa, and measures income and welfare over time, while also collecting a large array of data on individual and household characteristics for both adults and children (Brown et al. 2013). Survey waves have been collected approximately every two years since 2008. In Wave 3 (2012), 10,241 households were surveyed, comprising over 38,000 individuals.

Data sets collected prior to the NIDS struggled with issues of poor data quality on caregiver relationships to beneficiaries, and individual receipt (Budlender & Woolard 2006, Budlender et al. 2005, Williams 2007). The rich and precise nature of the data collected on child support grant beneficiaries and recipients, and the fortuitous timing of data collection over periods of change in the grant's eligibility rules make the NIDS an ideal data set to investigate the impact of grant receipt on any outcomes.

5.2 Patterns in Receipt

Application for grant receipt is not immediate for most South African children. Approximately forty percent of infants aged under a year were grant beneficiaries in 2012 - see Figure 1. However, receipt does rise fairly sharply after infancy, with rates of receipt recorded at more than seventy percent for children from the age of two. Receipt predictably declines the closer one approaches to the age limit, and there is a sharp cut-off in receipt at the age limit in each year.

Changes occur in this period for older teens in particular. If one takes a sample of fifteen-year-olds for example, their rates of receipt should clearly increase in each wave. In 2008, teens aged fifteen were not eligible for the grant (see Table 1), and thus very low rates of receipt are recorded for them in the data. By 2010, the age threshold was increased to sixteen, and the rates of receipt increased for fifteen-year-olds in Wave 2, to approximately thirty percent. By Wave 3 on the order of sixty percent of fifteen-year-olds

Figure 1: Average Child Support Grant Receipt by Age: Waves 1-3

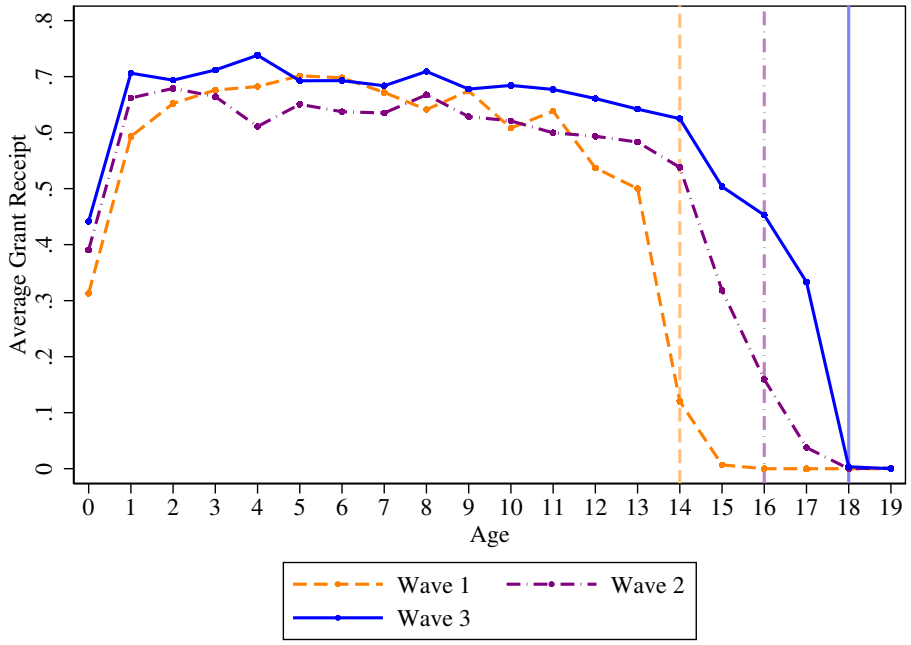


Figure 1 shows average child support grant receipt values at each age, in Waves 1, 2, and 3, using connected scatter plots. Each associated vertical line shows the CSG age threshold value in that wave. Data: National Income Dynamics Survey. Original source: Eyal & Burns (2016).

report receipt.

Some older children (aged fifteen and above) never accessed the grant, or may have only received it for some small proportion of their lives, and thus take-up in this group is not expected to be as high as those in the younger age brackets. The pattern of expansion was unlikely to create many new or late entries into receipt by older children, especially for only one or two potential years of receipt. Those that simply aged through the system should have had similarly large rates of receipt as younger children in 2012, and this is observed. For example, sixty-six percent of thirteen-year-olds received the grant in 2012, compared to sixty-five percent of ten-year-olds (see Figure 1).

5.3 Identification

5.3.1 Endogeneity

By nature, the estimation of any cash transfer effect is likely to be confounded by the presence of endogeneity, especially when it is known that beneficiaries differ from non-beneficiaries in characteristics which are related to the outcomes of interest. The roll-out

of the child support grant did not take place in a perfectly randomised way, making it difficult to estimate the causal effect of the grant. Researchers have attempted to deal with the endogeneity of grant receipt with various methods, including multivariate analysis with many control variables, difference-in-difference estimates, matching methods, regression discontinuity estimates and more (Coetzee 2013, Department of Social Development 2012, Samson et al. 2008, Aguero et al. 2009, Case et al. 2005, Ranchhod 2006, Williams 2007, Djebbari & Mayrand 2011, Ranchhod 2006).

We deal with endogeneity using multiple methods. First, we place a number of limitations on the sample. We use only Coloured[6] and African beneficiaries in our analysis, two groups who make up a substantially more homogenous sample compared to White teens, who differ significantly in terms of household income and receipt. We also make use of the means test eligible for the grant, which is a high proportion of children - eighty-three percent of this sample (see Table 2 below).

In addition, we utilise a sample of older teenagers in Wave 3, who experienced the random increase in the age threshold to eighteen in 2012. it is in this sample that the NIDS first reports child support grant receipt for older teens in substantial rates, and in which both potential duration of receipt, and average rates of receipt are at their highest. It is possible to compare individuals just on either side of the age threshold, who are very similar in characteristics, except for the variation in their grant receipt. This variation is mostly exogenous, relating as it does only to the unanticipated change in age threshold, and not to any individual characteristics. Some portion of grant receipt will still be related to individual characteristics, which are controlled for in all estimates.

The third strategy is to make use of the random differences in potential duration of receipt. The NIDS does collect information about the actual number of years of grant receipt. However, there are a number of limitations to this data, which preclude its use as a measure of grant receipt. These include poor data quality, endogeneity similar to reported CSG receipt, and its lack of availability for all teens in the sample (Eyal & Burns 2016). In contrast, the potential duration of receipt can be calculated for all teens, and displays large variability in 2012. For example, due to the pattern of extension, seventeen and eighteen-year-old teens in 2012 have had thirteen and six years of potential grant exposure each, a difference of seven years.

[6]In South Africa, Coloured is a commonly accepted term used to refer to those of Cape Malay descent, and to mixed race individuals.

Figure 2: Average Reported and Potential Duration of Grant Receipt by Age: Wave 3

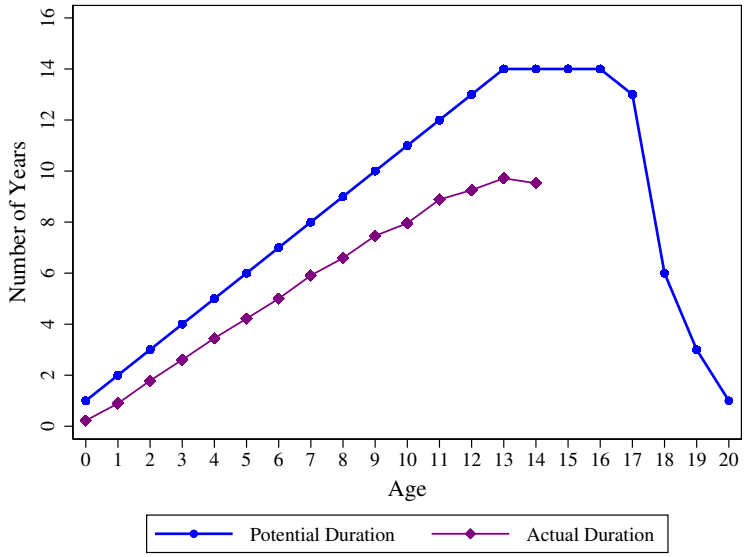


Figure 2 plots average years of exposure to the grant (potential duration), and average reported duration of receipt (collected only for those aged below fifteen) by age, in Wave 3 of the NIDS (2012). Potential duration of receipt increases linearly with age until age thirteen, at which point the particular pattern of expansion of CSG receipt to older children results in an uneven pattern of potential duration of receipt. Data: National Income Dynamics Survey. Original source: Eyal & Burns (2016).

Figure 2 plots average reported duration, and potential duration of exposure to the grant. Potential duration of receipt increases linearly with age until age thirteen, and then declines rapidly for children older than sixteen. In teens aged fifteen and above in 2012, potential duration of receipt is highly variable, ranging between three and fourteen years. This large difference in potential exposure to the grant is exogenous, and is determined entirely by birth year, and no other individual characteristics.

5.3.2 Beneficiary Characteristics

Before exploring the validity of the identification strategies in the data, it is necessary to investigate the attributes of the sample of teens discussed above. We examine the data for significant differences in characteristics between beneficiaries and non-beneficiaries in Table 2. Clear and significant differences in many key characteristics are recorded, which reflect those reported in the literature. All of these differences have p-values less than 0.01, except for two which are significant at the five percent level.

Beneficiaries are significantly younger and are more likely to live in households with other beneficiaries. Certain differences are related to the younger average age of bene-

Table 2: Individual Descriptive Statistics by CSG Beneficiary Status

Variable	All	CSG Beneficiary	Non Beneficiary	Sig.
Age	16.9	15.9	17.3	***
Female	0.50	0.49	0.50	
Coloured	0.09	0.04	0.11	***
African	0.91	0.96	0.89	***
Depressed	0.18	0.16	0.19	
Life Satisfaction (1-10)	4.82	4.64	4.90	
Enrolled	0.83	0.96	0.78	***
Years of Completed Education	8.90	8.11	9.20	***
Total Spending on Education (2011)	2,242	818	2,938	***
CSG Beneficiary	0.27	1.00	0.00	***
Duration of CSG Receipt	8.88	8.88	-	
Income Eligible for the CSG	0.83	0.96	0.78	***
Mother's Age	44.9	43.4	45.6	***
Mother's Education	7.83	7.04	8.15	***
Mother Economically Active	0.64	0.61	0.66	
Mother Resident in HH	0.76	0.78	0.75	
Mother is Depressed	0.27	0.29	0.25	
Father's Age	49.7	49.9	49.6	
Father's Education	7.72	6.04	8.32	***
Father Economically Active	0.78	0.68	0.81	***
Father Resident in HH	0.50	0.44	0.53	**
Father is Depressed	0.27	0.21	0.29	
Household Size	5.78	5.90	5.73	
Rural	0.48	0.56	0.45	**
Household Income	6,627	3,819	7,617	***
Household Grant Income	1,424	1,456	1,407	
Pensioner in Household	0.22	0.24	0.21	
Number of CSG Recipients in HH	1.72	2.92	1.29	***
Number of Observations	3,904	1,052	2,852	

This table presents descriptive statistics for child support grant beneficiaries and non-beneficiaries, and tests of significance by beneficiary status. The mean of duration of years of CSG receipt is missing for non-beneficiaries, as this data is only collected for those in current receipt of the grant. The sample consists of African and Coloured teenagers aged fifteen to nineteen in the National Income Dynamics Survey, Wave 3. Estimates presented are weighted using the sample weights from Wave 3. Significant differences are starred. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

ficiaries, such as higher rates of enrolment and fewer years of schooling. As expected, beneficiaries are of lower socio-economic status - they are more likely to be income eligible for the grant, to have lower household income and household educational spending, and to live in rural areas. Recipient mothers are younger, and have lower levels of education compared to non-recipient mothers. The fathers of beneficiaries also have lower education levels and are less likely to be economically active. Although maternal rates of residence do not differ by child beneficiary status, rates of paternal residency are lower for beneficiaries (a result which may be related to the higher socio-economic status of non-beneficiaries, which are more likely to live in dual incomes households).

These results show that estimates of the grant effect using reported receipt are indeed likely to suffer from endogeneity. We make use of balancing tests in the next section to confirm the validity of our identification strategies.

5.3.3 Significance Tests

Grant receipt in our chosen sample, of African and Coloured means test eligible fifteen to nineteen-year-olds in 2012, can be described as conditionally random. In this sample, the identification of the grant receipt coefficient arises from two comparisons: adolescents just above and below the age threshold, and beneficiaries and non-beneficiaries of the same age. Except for an expected one year difference in age, those above and below the threshold should not differ substantively in individual characteristics (except for variables related to age). To confirm this, significance tests of differences in a number of variables are performed in a number of age-defined samples, and the results can be seen in Table 3.

For fifteen and sixteen-year-olds, beneficiaries do not differ in a host of attributes, including gender, race, maternal characteristics (maternal age, education, labour market status, residence in the household, depression level), paternal characteristics (paternal residence in the household and depression level), and household characteristics (household income, size, number of children, pensioner present in household, and a measure of self-perceived poverty). In all age samples except for fifteen-year-olds, beneficiaries and non-beneficiaries have significantly different means for residence in a rural area, although with no clear pattern in either direction.

More significant differences in individual qualities are evident in the seventeen to eighteen-year-old sample, with the latter group age ineligible for the grant. Many of

Table 3: Significance Tests of Differences in Mean Characteristics by Beneficiary Status: Wave 3

	Age 15			Age 16			Age 17			Ages 15-17			Ages 17-18		
Receive CSG?	Yes	No		Yes	No		Yes	No		Yes	No		Yes	No	
Age	15.0	15.0		16.0	16.0		17.0	17.0		15.9	16.2	***	17.0	18.0	***
Female	0.50	0.52		0.50	0.53		0.46	0.44		0.49	0.49		0.47	0.53	
Coloured	0.04	0.09		0.04	0.08		0.04	0.08	*	0.04	0.08	**	0.05	0.06	**
African	0.96	0.91		0.96	0.92		0.96	0.92	*	0.96	0.92	**	0.93	0.94	**
Mother's Education	7.36	7.38		6.72	7.42		6.56	7.76	***	6.91	7.57	**	6.83	6.82	**
Mother's Age	42.2	43.6		44.6	45.8		43.9	45.1		43.5	45.0	*	44.0	46.6	***
Mother Economically Active	0.62	0.60		0.59	0.62		0.65	0.58		0.61	0.60		0.61	0.59	
Mother Resident in HH	0.79	0.74		0.83	0.74		0.79	0.66	**	0.81	0.70	***	0.78	0.67	*
Father Resident in HH	0.35	0.31		0.39	0.32		0.50	0.39		0.40	0.35		0.54	0.33	***
Years of Education	7.47	7.26		8.09	8.12		8.80	8.73		8.06	8.16		8.86	9.52	***
Enrolled	0.98	0.87	***	0.96	0.89	**	0.92	0.86	*	0.96	0.87	***	0.93	0.75	***
Depressed	0.13	0.23	**	0.18	0.19	**	0.16	0.21	**	0.16	0.21	*	0.17	0.19	*
Mother is Depressed	0.31	0.29		0.21	0.23		0.35	0.38		0.29	0.31		0.34	0.32	
Father is Depressed	0.22	0.31		0.27	0.36		0.19	0.33		0.23	0.33		0.14	0.39	**
Life Satisfaction (1-10)	4.75	4.97		4.58	4.01	*	4.60	4.66	*	4.65	4.54	*	4.59	4.55	*
Rural	0.61	0.54		0.67	0.49	**	0.53	0.57	**	0.59	0.54	*	0.51	0.56	*
Household Income	3,081	10,311		3,526	3,733		3,295	4,620	*	3,273	5,913	*	3,649	3,474	*
Household Grant Income	1,497	1,834	*	1,554	1,664	*	1,588	1,464	*	1,490	1,546	*	1,540	1,409	*
Total Spending on Education	1,782	2,695		2,083	3,220	**	2,150	3,594	*	1,991	3,242	***	2,275	3,089	***
Household Size	6.11	6.68		6.63	6.63		5.96	6.39		6.09	6.27		5.93	6.19	
Number of Children in HH	3.39	3.37		3.53	3.29		3.20	3.37		3.24	3.15		3.12	2.37	***
Pension Household	0.28	0.34		0.26	0.28		0.23	0.29		0.25	0.29		0.22	0.24	
Poorest Household	0.32	0.32		0.30	0.24		0.23	0.28		0.28	0.27		0.20	0.20	
Number of Observations	348	228		337	251		252	349		937	828		278	623	

This table presents mean values and significance tests of differences in individual characteristics between beneficiaries and non-beneficiaries in 5 age-defined samples. The sample used is that of African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant. Weighted estimates are used, using the Wave 3 sample weights. In Wave 3, individuals aged eighteen and above are age ineligible for the child support grant. Significant differences are starred. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01. Original source: Eyal and Burns (2016).

these differences are obviously related to the difference in age: eighteen-year-olds live in households with fewer children (children are more likely to leave the household the older they are), and have older mothers with correspondingly higher maternal education, and have higher levels of education themselves (and a lower probability of being enrolled). Differences potentially unrelated to age include higher rates of parental residence for eighteen-year-olds, and lower levels of paternal depression,.

Turning to income measures, significant differences are observed in household grant income. However these differences are inconsistent across the age groups, are not sizeable, and are significant at only the ten percent level. Total educational spending is significantly higher for non-beneficiaries (significance ranges from one to ten percent, depending on the sample) for all age groups except for fifteen-year-olds. Household income differs in the older age groups, although at only marginally significant levels[7].

Certain outcomes have positive and significant associations with grant receipt. Beneficiaries are much more likely to be enrolled, are less likely to be depressed, and in three of the five age samples have significantly higher levels of life satisfaction than non-beneficiaries. However, there is no significant difference in years of schooling by beneficiary status for all teens below the age of eighteen.

The lack of significant differences in the younger adolescent samples implies that grant receipt is more likely to be exogenous for these teens, and unrelated to personal characteristics. The unanticipated extension of the age limit adds a high degree of exogenous variation to receipt along the age eligibility margin. In these samples, endogeneity may be less of a concern, as the initial eagerness of mothers to obtain the grant is less likely to affect older children (Aguero et al. 2009), as caregivers do not have to exert any effort to ensure continued receipt. We know that maternal eagerness may be correlated with household preferences for education, which may confound estimates, and thus we account for maternal and paternal education in our estimates.

All regression analysis includes an appropriate sub-set of the relevant covariates in Table 3 as control variables, in particular those showing significant differences here. The inclusion of these covariates improves precision in estimates, and controls for sample selection (Imbens & Lemieux 2008). We now turn to investigate the patterns in the two

[7]The differences in the mean of household income for fifteen-year-olds beneficiaries and non-beneficiaries is very high, despite their lack of significance. The insignificance of these rather large differences arises due to a high variance in household income among non-beneficiaries, which is expected given the relatively small size of this sample.

educational outcomes of interest to this paper, enrolment and years of schooling.

5.4 Patterns in Enrolment and Years of Schooling

Patterns of enrolment in each wave of the NIDS can be seen in Figure 3, with a vertical line denoting the legal minimum school leaving age of fifteen. Enrolment is more variable after age fifteen, as expected. In 2012 (Wave 3), thirteen-year-olds have close to a hundred percent enrolment, while approximately eighty-seven percent of eighteen-year-olds are enrolled. Despite the minimum school leaving age of fifteen, enrolment does not begin to fall sharply at that point, but rather begins to decline steeply before the age of eighteen in both Waves 1 and 3.

Figure 3: Average School Enrolment by Wave

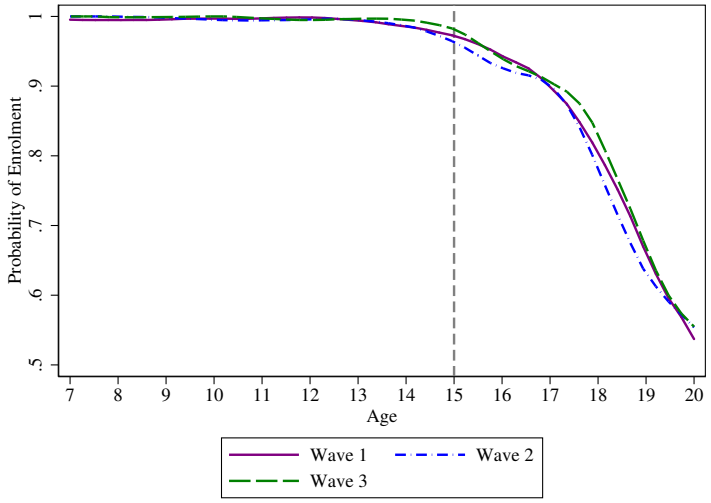


Figure 3 shows average school enrolment by age category and wave, for African and Coloured fifteen to nineteen-year-olds. The vertical line shows the legal minimum school leaving age of fifteen. Data: National Income Dynamics Survey.

Enrolment dips between Wave 1 and 2 for certain older teens, and rises back to its original levels in Wave 3. This rather perplexing result has been documented in other research papers (Branson, Kekana & Lam 2013), and implies caution should be taken in any dynamic analysis of enrolment between Wave 2 and 3 in particular (as no specific systemic reason is present to account for this change in enrolment between waves).

The descriptive statistics in Table 2 indicate that enrolment may be higher for child support grant beneficiaries. Figure 4 graphs average school enrolment by receipt sta-

Figure 4: Enrolment and Years of Schooling by Beneficiary Status

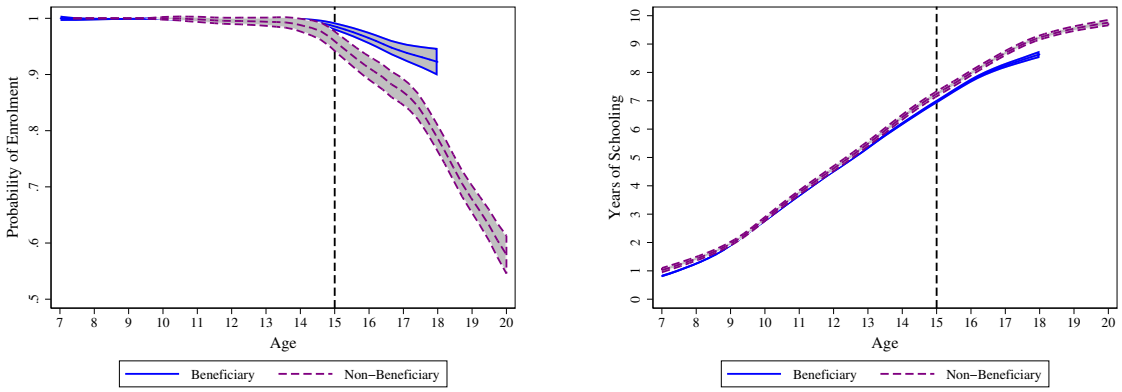


Figure 4 shows average school enrolment and years of schooling attained over age and by beneficiary status, in Wave 3, for African and Coloured fifteen to nineteen-year-olds, with ninety-five percent confidence intervals. The vertical line represents the legal minimum school leaving age of fifteen. Data: National Income Dynamics Survey.

tus in Wave 3 with ninety-five percent confidence intervals. We observe that after the school leaving age, CSG beneficiaries have enrolment rates significantly higher than non-beneficiaries.

Turning to years of education attained in Figure 4, we see that beneficiaries achieve approximately half a year of schooling less than non-beneficiaries by age eighteen, and this difference is significant at the five percent level. It is possible that although beneficiaries are more likely to be enrolled, this does not translate into gains in actual learning. Further examination which takes into account the endogeneity of grant receipt is needed. Section 6 presents multi-variate estimates of the impact of grant receipt on the educational outcomes of older teens, using both non-parametric and parametric techniques.

6 Results

Section 5.4 has presented patterns which support the hypothesis of increased enrolment in beneficiaries compared to non-beneficiaries. However these results are likely to suffer from the endogeneity in the reported grant receipt variable. In this section we make use of non-parametric and parametric estimates which exploit the random variation in the potential duration of receipt to identify the effect of grant receipt.

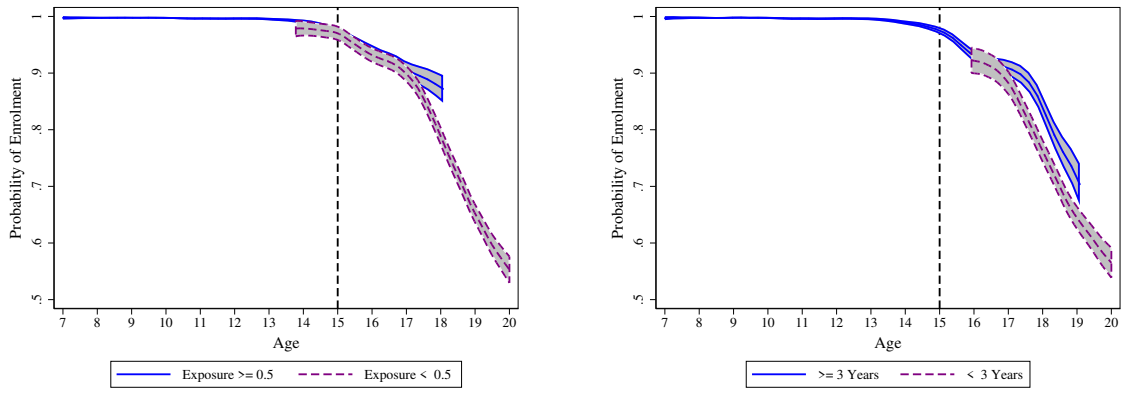
6.1 Non-Parametric Estimation

Following Duflo (2000), non-parametric regressions are estimated as follows:

$$Y_i = g(Age_i) + \epsilon_i$$

Y_i is enrolment, for individual i, and Age_i is the age of the child. ϵ_i is an error term, where $\epsilon_i \sim i.i.d[0, \sigma_\epsilon^2]$, and $g()$ is the un-specified regression function. A kernel weighted local polynomial regression, using the epanechnikov kernel is used (Cameron & Trivedi 2009). This method allows the most unrestricted estimation of any model relating enrolment and receipt.

Figure 5: Enrolment by Proportion of Life Exposed to the Grant



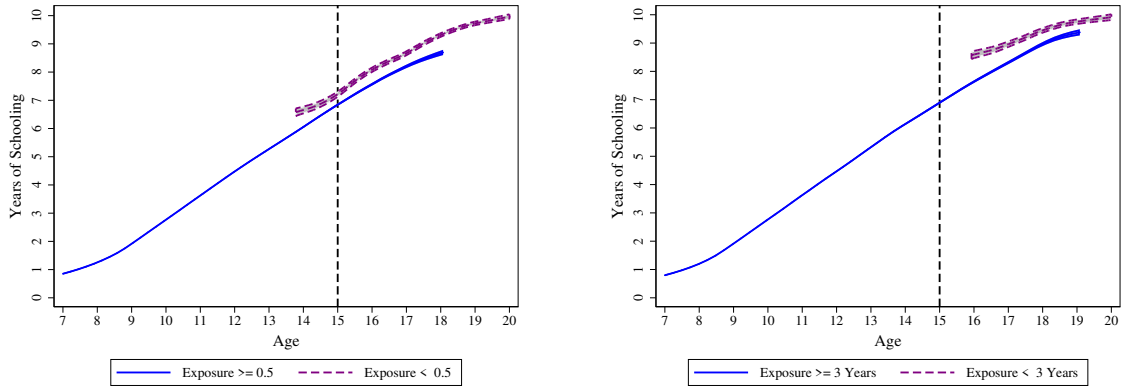
The probability of enrolment is graphed in Figure 5, for those with more or less than half of their lives exposed to grant receipt, with ninety-five percent confidence intervals. The second figure graphs enrolment for individuals with more or less than three years of exposure to grant receipt. The vertical line shows the legal minimum school leaving age of fifteen. Sample: African and Coloured children in the National Income Dynamics Survey.

Using this method, the probability of enrolment is graphed for those with more, or less than half of their lives exposed to grant receipt (see Figure 5). The oldest a teen

can be who has been exposed for more than fifty percent of their life is nineteen in Wave 3. The dashed curve ends abruptly because any child younger than thirteen has been exposed to the grant for more than fifty percent of their life. The second figure graphs enrolment for individuals with more or less than three years of exposure to grant receipt. In both figures it can be seen that those with more exposure have a higher probability of being enrolled, and these differences are significant at the five percent level.

We examine years of schooling achieved in Figure 6, and find a reverse pattern - those with higher years of exposure to the grant obtain fewer years of schooling on average. The effect is not large (approximately 0.2 of a year for those exposed to the grant for more than fifty percent of their life), but is significant at the five percent level. This accords with the results in Figure 4. Although we may have progressed in removing some of the endogeneity in the estimates, the results in Table 2 show that multivariate analysis is important when estimating the grant effect. This is performed in the next section.

Figure 6: Years of Schooling by Proportion of Life Exposed to the Grant



The total years of schooling achieved is graphed in Figure 6, for those with more or less than half of their lives exposed to grant receipt, with ninety-five percent confidence intervals. The second figure graphs years of schooling for individuals with more or less than three years of exposure to grant receipt. The vertical line shows the legal minimum school leaving age of fifteen. Sample: African and Coloured children in the National Income Dynamics Survey.

6.2 Parametric Estimation

6.2.1 Specifications

We turn to multivariate analysis of the grant effect on enrolment and years of schooling, using three specifications, motivated by the identification strategies discussed in Section 5. Specification (1) uses multiple linear regression, with reported child support grant receipt as the main determinant of interest. This is modelled as follows:

$$Y_i = \beta_0 + \beta_1 CSG_i + \alpha X_i + \gamma HH_h + \epsilon G_g + u_i \quad (1)$$

Y_i reflects enrolment or years of schooling for individual i, in household h, and geographical area g. CSG_i reflects reported receipt, X_i includes age, gender, mother's education, a binary variable for race, maternal presence in the household and other important individual characteristics. HH_h is a vector of household characteristics including the log of household income and spending on education, and household size. G_g includes geographical controls, including binary variables for the provinces, and an indicator of living in a rural area. u_i represents the regression error. Specification (3) is a replication of Specification (1), using potential duration of receipt as the CSG_i variable, instead of reported receipt.

Specification (2) uses two-stage least-squares (2SLS) in the means test eligible sample, with CSG_i instrumented for using a binary variable indicating age eligibility[8], called $Elig_i$. The combination of the large fall in grant receipt around the age eligibility limit for those in the means test sample, and the presence of some inclusion errors, lends itself to estimation of the grant effect using a fuzzy regression discontinuity design (Imbens & Lemieux 2008), implemented using 2SLS. This strategy is not unique, especially in the South African literature, where age eligibility, a change in age eligibility, or the number of age-eligible individuals in a household have all been used to instrument for the receipt

[8]It is possible to create a variable which reflects full eligibility for the grant from both an age and income perspective. A means test binary variable is used in this analysis to restrict the main sample, eighty-nine percent of grant beneficiaries qualify as income eligible according to our calculations, and ninety-six percent of teens - see Table 2. However given the much higher precision in age data compared to income data, and the difficulty in ensuring a dual income variable for both parents is calculated correctly, we choose to restrict the sample to means test eligible teens (as calculated using reported maternal and paternal income data). Age eligibility is then used as the only instrument for reported grant receipt, and household income is controlled for to improve the precision of any estimates of grant impact.

of either the pension or child support grant (Samson et al. 2004, Duflo 2003, Abel 2013, Bertrand, Sendhil & Miller 2003). In Wave 3, in the fifteen to nineteen-year-old sample, *Elig* is one for those aged fifteen to seventeen, and zero for those aged eighteen and nineteen.

The first assumption for an IV is that of a strong first stage. Table 10 in Appendix Item A.2 shows that age-eligible teens are found to have a far higher probability of receipt than ineligible teens: in fact forty-three percentage points higher, implying $Elig_i$ is a possible instrument for CSG_i. The second requirement for 2SLS is for an exclusion restriction to hold, which is that the instrument is randomly assigned, i.e. $Cov(Elig_i, u_i) = 0$. We assume conditional random assignment, i.e. after controlling for age in the fifteen to nineteen-year-old sample, eligibility is exogenous. In Wave 3, due to the staggered roll-out of the grant to older teens, age eligibility is random (particularly because the eligibility variable - age - cannot be manipulated by would-be recipients). The last assumption required is monotonicity, which requires that no individual is excluded from grant receipt by being age-eligible (Angrist & Pischke 2008). This is a trivial assumption given the child support grant age eligibility condition.

Given a strong first stage, a valid exclusion restriction, and satisfaction of the monotonicity requirement,the IV coefficient from Specification (2) can be interpreted as not only the local average treatment effect, but also the average treatment effect (Angrist & Pischke 2008). This is a powerful result and supports the external validity of our results - we obtain estimates of the causal effect on *all* grant recipients, not only those who receive the grant purely due to age eligibility. See Appendix Item A.2 for a detailed discussion of the assumptions and requirements for the 2SLS estimation in Specification (2).

6.2.2 Estimates

Table 4 contains the results of the estimates from Specifications (1) to (3). In Column (1), reported receipt is associated with enrolment that is higher by eight percentage points, an effect which is significant at the one percent level. In Column (2), the IV results show a seventeen percentage point increase in enrolment due to grant receipt (significant at the five percent level). In Column (3), the potential duration coefficient is reported to show the impact of an extra ten years of exposure. Students who have ten more years of

Table 4: Determinants of Enrolment and Years of Schooling in Wave

Dependent Variable	Enrolment			Years of Schooling		
	(1)	(2)	(3)	(4)	(5)	(6)
Actual Receipt	0.08 ***			0.15 *		
Age Eligibility (IV)		0.17 **			0.23	
Potential Duration X 10			0.16 ***			0.07
Age in Years	-0.11 ***	-0.09 ***	-0.08 ***	0.69 ***	0.71 ***	0.68 ***
Female	-0.04 ***	-0.04 ***	-0.04 **	0.63 ***	0.63 ***	0.63 ***
Depressed	-0.04 *	-0.03	-0.04 **	-0.17 *	-0.16 *	-0.18 *
Log of HH Education Spending	0.03 ***	0.03 ***	0.03 ***	0.13 ***	0.13 ***	0.13 ***
Mother has a Matric	0.04 **	0.04 **	0.03 *	0.74 ***	0.74 ***	0.73 ***
Years of Schooling	0.04 ***	0.04 ***	0.04 ***			
Coloured	-0.13 ***	-0.12 ***	-0.13 ***	-0.01	0.00	-0.02
Mother Resident in HH	0.01	0.00	0.02	-0.13 *	-0.14 *	-0.11
Log of Household Income	-0.01	-0.01	-0.01	0.13 ***	0.13 ***	0.13 **
Household Size	0.00	0.00	0.00	-0.05 ***	-0.05 ***	-0.05 ***
Rural	0.01	0.01	0.01	-0.10	-0.11	-0.10
Dependent Variable Mean		0.81			8.76	
Number of Observations	2,071	2,071	2,071	2,076	2,076	2,076
F stat	27.3	25.6	26.6	72.9	71.8	70.7
Adjusted R-squared	0.24	0.23	0.24	0.34	0.34	0.34

Three specifications are used to estimate the impact of CSG receipt on enrolment and years of schooling. In Columns (1) and (4), reported receipt is used as the CSG variable of interest. In Columns (2) and (5), instrumental variables estimates are presenting, using age eligibility as an instrument for actual receipt. In Columns (3) and (6), the impact of potential duration of CSG receipt is shown. The sample used is that of African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant. A full set of province indicators is included in each specification. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

exposure[9] than other students have a much higher probability of being enrolled (sixteen percentage points), an effect which is significant at the one percent level[10]. All of these are large effects in a sample with high levels of baseline enrolment, at eighty-one percent (see Table 4).

Turning to the other significant determinants of enrolment, we see that older students[11] and female students have a lower probability of enrolment, as do Coloured teens (effects of approximately ten, four, and thirteen percentage points respectively, nearly all significant at the one percent level). Educational spending, maternal matric certificate and years of attained schooling raise the probability of enrolment (the effect sizes are approximately thirty percentage points for a ten percent increase in educational spending, and four percentage points for both maternal matric and years of schooling). These effects are significant at the one or five percent level. Depressed teens may be less likely to be enrolled, but this effect is not consistently significant.

Household income does not significantly impact on enrolment, in contrast to educational spending. If mothers have a greater degree of control over how grant income is spent compared to overall household income, this result is as expected, as mothers have been seen to direct extra income to child specific expenses such as the costs of schooling (Bourguignon, Browning, Chiappori & Lechene 1993). This will hold in particular if the degree of income pooling in the household is small, as in South African households (Delany 2008).

In comparison to the positive grant effects on enrolment, grant receipt does not significantly predict years of schooling, as can be seen in the three specifications reported in Columns (4) to (6) of Table 4. This is possibly to be expected for the estimates in Columns (4) and (5), which measure the impact of current receipt rather than cumulative, on years of schooling. However, potential duration of receipt as a cumulative measure seems more likely to be associated with education attained, a stock variable, and yet it is not.

[9] A comparison of ten years allows a realistic measurement of the approximate average impact of cumulative years of grant exposure that could be expected to be observed in this sample, given that potential duration varies from three to fourteen years for fifteen to nineteen-year-olds in Wave 3.

[10] For another comparison, consider seventeen and eighteen-year-old teens in 2012, who have thirteen and six years of potential exposure respectively, a difference of seven years. After controlling for other differences, these estimates predict enrolment that is eleven percentage points higher for seventeen-year-olds (0.16/10 multiplied by the seven year difference) compared to eighteen-year-olds.

[11] It is necessary to control for age in these estimates, due to the downward trend in enrolment for older children.

We see that older teenagers have significantly higher education (as expected), as do female teens (in contrast to the negative female effect for enrolment), and those whose mothers have a matric certificate. These three effects are large and similar in size, at approximately 2/3 of a year. Increased household size lowers educational achievement, but this is a small effect. Both educational spending and household income raise educational attainment (a ten percent increase in household educational spending or income raises years of schooling by 1.3 years, a large effect). This is in contrast to enrolment, where household income did not predict increased enrolment. All but one of these effects are significant at the one percent level, with household income in Column (6), which is significant at the five percent level.

6.3 Sub-Sample Analysis

The literature suggests that differences may exist in the grant effect in certain subgroups. Specification (1), the results of which are seen in Columns (1) and (4) in Table 4, is re-estimated for different sub-samples, and the results are shown in Table 5. The results from the identical sample analysis using the instrumental variables estimates are quantitatively similar, although larger and with moderate differences in significance levels (see Appendix Item A.3, Table 11). As the smallest coefficients seen in all of the enrolment estimates in Table 4, the ordinary least squares estimates (OLS) are used as the most conservative estimates of grant impact on enrolment. The four numbers reported are the increase in enrolment related to grant receipt, the significance level, the mean of the dependent variable in the sample (mean enrolment or years of schooling), and the number of observations in that sample. The top line in this table corresponds to the OLS coefficients in the first and fourth columns of Table 4.

The positive effect of receipt on enrolment is significant at the one percent level in all samples. Particularly high values are seen for Coloured teens[12], teens in urban areas, and those in households with a pensioner present (twenty-one, thirteen and fourteen percentage points respectively). Of interest is that a positive and significant impact of the grant is now seen on years of schooling in certain sub-samples, although these coefficients are fairly small (most of them less than 0.15), with significance at mostly the ten percent

[12]This group has particularly low rates of enrolment at sixty-one percent, compared to values above eighty percent in most other samples.

level. Coloured, female, and pensioner resident teenagers report approximately 0.25 of a year more schooling on grant receipt.

Table 5: Determinants of Enrolment and Years of Schooling (Selected Sub-Samples)

Samples	Enrolment		Years of Schooling	
Means Test Eligible	0.08	***	0.15	*
Mean, Sample Size	0.81	2,071	8.76	2,076
All	0.08	***	0.14	*
(Means Test Eligible and In-Eligible)	0.82	2,429	8.86	2,434
Coloured	0.21	***	0.26	*
	0.63	259	8.83	259
African	0.06	***	0.12	*
	0.84	1,812	8.75	1,817
Female	0.08	***	0.24	**
	0.80	1,076	9.07	1,079
16 and 17 Year Olds	0.10	***	-0.01	**
	0.89	857	8.51	859
Pensioner Household	0.14	***	0.30	*
	0.83	579	8.73	581
Rural	0.05	***	0.08	*
	0.84	1,333	8.68	1,337
Urban	0.13	***	0.17	*
	0.76	738	8.92	739

The main ordinary least squares estimates of grant receipt impact on enrolment and years of schooling are replicated in specific sub samples of the base sample (African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant). The four elements reported are percentage point changes and significance, mean level of enrolment or education, and number of observations. For example, the entire sample has 2,071 observations, the effect of receipt on enrolment is eight percentage points, the mean level of enrolment in this sample is eighty-one percent, and this coefficient is significant at the one percent level. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

The next section performs a number of robustness and validity checks of both the parametric and non-parametric results.

6.4 Validity and Robustness of Results

In this section, the grant effects are investigated further, and tested for validity using a number of different methods. These include the use of different samples, data sets, and specifications.

6.4.1 Receipt and the Younger Child

To begin, the grant impacts are estimated using a sample of younger children below the age of fifteen - see Table 6. Ordinary least squares estimates are presented in Columns (1), (3) and (5), estimating the impact of reported receipt, and instrumental variables estimates are presented in Columns (2), (4) and (6), with reported duration of receipt instrumented for using potential duration of grant receipt. These estimates cannot be performed for teens older than fifteen as duration of CSG receipt data is not collected in the adult questionnaire. Age is not included in the instrumental variable estimates, as in the younger sample (children aged thirteen or lower), potential duration increases linearly with age (see Figure 2 in Section 5), making estimating the effect of duration of receipt impossible if age is included.

Very small grant effects on enrolment are expected, due to the near one hundred percent rate of enrolment in this sample, and this is confirmed in the table. Receipt is associated with a one percent higher rate of enrolment, a coefficient which is only significant at the ten percent level. Of interest is that a positive and significant effect of receipt is seen on years of education in both samples: an additional 0.16 years of schooling for seven to fourteen-year-olds, and a quarter of a year for ten to fourteen-year-olds. Both effects are significant at the one percent level.

The instrumental variables estimates show that duration of receipt is associated with a large and significant increase in average schooling. An extra year of receipt for current grant beneficiaries is associated with average years of schooling nearly 1.5 years higher in the sample aged seven to fourteen years old, and just over two years higher for children aged between ten and fourteen. This result only applies to current beneficiaries, as the NIDS does not collect data on duration of receipt for those currently not receiving the grant.

Table 6: Determinants of Enrolment and Schooling: Children Aged Seven to Fifteen

Dependent Variable	Enrolment		Years of Schooling			
Age Range	7 – 14 Years Old		7 – 14 Years Old		10 – 14 Years Old	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Actual Receipt	0.01 *		0.16 ***		0.24 ***	
Duration of Receipt		0.00		1.45 ***		2.16 ***
Dependent Variable Mean	1.00	1.00	3.59	3.47	4.99	4.93
CSG Variable Mean	0.86	8.59	0.85	8.19	0.84	9.26
First Stage Instrument Coefficient		0.44 ***		0.64 ***		0.47 ***
Number of Observations	3,458	2,268	4,065	2,676	2,435	1,543
F stat	0.78	0.25	945	34.1	170	2.90
Adjusted R-squared	0.00		0.80		0.54	

Two specifications are used to estimate the impact of CSG receipt and the duration of receipt on enrolment and years of schooling in Wave 3 of NIDS. In Columns (1), (3) and (5), reported receipt is used as the CSG variable of interest. In Columns (2), (4) and (6), instrumental variables estimates are presented, using potential duration as an instrument for actual duration of receipt. The sample is comprised of African and Coloured learners between the ages of seven and fourteen who are means test eligible for the child support grant. The years of schooling estimates are replicated for a slightly older sample of children aged ten to fourteen years old. A full set of province indicators is included in each specification. The first stage instrument coefficient presents the coefficient on potential duration in the first stage CSG duration regression. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

6.4.2 External Validity: General Household Survey Estimates

The effect of child support grant receipt on enrolment and years of schooling is also investigated using the 2012 General Household Survey (see Table 7), in a similar sample of means test eligible African and Coloured teens aged fifteen to nineteen. The General Household Survey is a nationally representative survey collected by Statistics South Africa, containing 91,859 individuals in 25,365 households in 2012, designed to evaluate the welfare of South Africans (StatsSA 2012).

The enrolment results are very similar in both size and significance to the corresponding estimates in Table 4. This is despite slight differences in the variables controlled for, and the method of calculating means test eligibility, due to a lack of data in the GHS for certain variables. Grant receipt raises enrolment by approximately ten percentage points (in both the OLS and IV estimates), and an extra ten years of exposure to the grant is associated with enrolment that is higher by sixteen percentage points[13]. Grant receipt in the OLS model in Column (4) is associated with nearly a quarter of a year more schooling attained, although this effect is only significant at the ten percent level. The IV effect of receipt on years of schooling is insignificant. However, an additional ten years of potential grant receipt is associated with an extra half a year of education attained, significant at the one percent level. Apart from this result, the remainder of the estimates correspond to the estimates using the NIDS in Table 4. The OLS estimates have again appeared as a lower bound, and thus the most conservative estimates of the grant effect.

6.4.3 Estimation Issues

Multicollinearity concerns motivated the exclusion of certain variables in the appropriate specifications (such as number of children, adults and pensioners in the household, household grant income, potential duration, education deficit). Their removal improves precision, but does not impact on the coefficients of interest. Overall, the inclusion or exclusion of other controls does very little to change the sign, magnitude or significance of these positive grant coefficients in all three enrolment models.

The enrolment estimates are replicated excluding education level, in order to use an exactly identical set of controls in the estimates of both enrolment and schooling, as

[13]The corresponding figures are eight, seventeen and sixteen percentage points in the NIDS data used in Table 4.

Table 7: Determinants of Enrolment and Schooling: General Household Survey 2012

	Enrolment			Years of Schooling		
	(1)	(2)	(3)	(4)	(5)	(6)
Actual Receipt	0.10 ***			0.26 *		
Age Eligibility (IV)		0.10 ***			0.04	
Potential Duration X 10			0.16 ***			0.49 ***
Age in Years	-0.08 ***	-0.08 ***	-0.06 ***	0.66 ***	0.59 ***	0.72 ***
Female	-0.05 ***	-0.05 ***	-0.05 ***	0.53 ***	0.54 ***	0.56 ***
Years of Schooling	0.03 ***	0.03 ***	0.03 ***			
Coloured	-0.15 ***	-0.15 ***	-0.14 ***	-0.01	-0.02	0.23
Mother Resident in HH	0.00	0.00	0.01	0.09	0.09	0.04
Log of Household Income	0.01	0.01	0.01	0.12 **	0.12 **	0.12 ***
Household Size	0.00	0.00	0.00	-0.05 ***	-0.06 ***	-0.05 ***
Rural	0.03	0.03	0.04 **	-0.27 ***	-0.27 ***	-0.26 ***
Dependent Variable Mean	0.82	0.82	0.83	8.80	8.80	8.72
CSG Variable Mean[+]	0.49	0.50	10.0	0.49	0.49	10.0
Number of Observations	3,142	3,142	3,986	3,147	3,147	3,994
F stat	44.3	44.1	45.7	71.5	71.4	83.0
Adjusted R-squared	0.20	0.20	0.18	0.24	0.24	0.24

Three specifications are used to estimate the impact of CSG receipt on enrolment and years of schooling in the 2012 General Household Survey. In Columns (1) and (4), actual receipt is used as the CSG variable of interest. In Columns (2) and (5), instrumental variables estimates are presenting, using age eligibility as an instrument for actual receipt. In Columns (3) and (6), the impact of potential duration of CSG receipt is shown. [+]The means of the three CSG variables of interested are reported: in Column (1), forty-nine percent of the sample are receiving the CSG, in Column (2) fifty percent of the sample are age eligible for the grant, and in Column (3) the average potential duration of receipt is ten years. The sample is comprised of African and Coloured teens between the ages of fifteen and nineteen, who are means test eligible for the grant. A full set of province indicators is included in each specification. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

opposed to those reported in Table 4 which contain years of education as a control in the enrolment estimates in Columns (1) to (3). The main results do not differ in any meaningful way.

The results of a number of consistency checks using different samples and specifications are presented in Table 8. The first line replicates the main OLS results from Table 4, reporting the coefficient on reported receipt. The second set of results contains results from the means test ineligible sample, followed by the full sample. No grant effect is observed in the much smaller means test ineligible sample, while the full sample effect mimics that of the means test eligible sample, reflecting the high proportion of adolescents who are income eligible for the grant.

We then examine two younger samples, that of fourteen and fifteen-year-olds. No significant grant effect is expected on enrolment for fourteen-year-olds, given the high enrolment in this sample, and none is seen. As enrolment begins to drop for fifteen-year-olds, the CSG effect becomes significant. The grant impacts both enrolment *and* surprisingly, years of schooling (a third of a year more), with these effects significant at the one percent level.

We use different measures of receipt: current or past receipt in the last two years, whether the household contains a grant beneficiary, and the number of grant beneficiaries in the household[14], i.e. in Wave 3 or Wave 2. The household measures have no impact on outcomes (and neither do the household fixed effects estimates), while past or current receipt significantly raises both enrolment and schooling (eight percentage points and 0.16 of a year). It appears that individual CSG receipt matters most, and that possible spillover effects from CSG recipients to non-recipients (seen in earlier literature) are not present to any great degree[15].

Table 8 also reports average partial effects from logit and probit estimates of enrolment. These effects are close to identical in size and significance to the ordinary least squares specification. Regarding the CSG effects on education in Table 8, apart from the two effects mentioned above, none of the coefficients reported are significant at any level below ten percent.

[14]Approximately thirty-two percent of individuals in the base sample are current grant recipients, and forty-three percent are current or past recipients.

[15]This result lends weight to the identification strategy used in this paper, as spillover is a potential concern in any experimental or quasi-experimental study.

Table 8: Determinants of Enrolment and Years of Schooling: Robustness Checks

Dependent Variable	Enrolment		Years of Schooling	
Means Test Eligible CSG Effect	0.08	***	0.15	*
Mean, Sample Size	0.81	2,071	8.76	2,076
Means Test Ineligible	0.06		0.05	
	0.88	327	9.57	327
Full Sample	0.08	***	0.14	*
	0.82	2,429	8.86	2,434
14 Year Olds	0.03		0.15	
	0.99	586	6.79	596
15 Year Olds	0.06	***	0.35	***
	0.97	505	7.58	507
Past or Current Receipt	0.08	***	0.16	**
	0.81	2,071	8.76	2,076
CSG Household	0.00		-0.20	*
	0.81	2,071	8.76	2,076
Number of CSG Recipients	0.01		-0.04	
In the Household	0.81	2,071	8.76	2,076
Logit Marginal Effects	0.10	***		
	0.81	2,071		
Probit Marginal Effects	0.10	***		
	0.81	2,071		
Household Fixed Effects	0.14		0.26	
	0.81	2,071	8.76	2,076

The main ordinary least squares estimates are replicated in a number of different samples and specifications, and the coefficient on CSG receipt is reported. The base sample is African and Coloured teens between the ages of fifteen and nineteen who are means test eligible for the child support grant in Wave 3 of the NIDS. The four elements reported are percentage point changes and significance, mean level of enrolment or education, and number of observations. For example, the means test eligible sample has 2,071 observations, the effect of receipt on enrolment is eight percentage points, the mean level of enrolment in this sample is eighty-one percent, and this coefficient is significant at the one percent level. The logit and probit results report average partial effects. The fourteen year old sample does not include depression as a control, as this data is lacking in the child file. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

6.4.4 Alternative Educational Outcomes

The estimates are also performed using a number of other educational outcomes as dependent variables (see Table 9).

Table 9: Grant Impact on Alternative Educational Outcomes (Sub-Sample Analysis)

Samples	Education Deficit		On Target or Ahead		Repeater		Skipper		Days Missed	
Means Test Eligible	-0.04		-0.03		0.02		-0.02		-0.14	
Sample Size, Mean	2,072	1.48	2,076	0.30	2,076	0.42	2,076	0.06	4,610	0.74
All	-0.04		-0.03		0.01		-0.01		-0.15	
(Means Test Eligible and In-Eligible)	2,428	1.38	2,434	0.33	2,434	0.40	2,434	0.06	5,573	0.70
Coloured	0.00		-0.04		0.07		0.00		-0.18	
	259	1.46	259	0.28	259	0.41	259	0.03	580	0.89
African	-0.04		-0.04		0.02		-0.03	*	-0.10	
	1,813	1.48	1,817	0.30	1,817	0.43	1,817	0.06	4,030	0.71
Female	-0.07		-0.04		0.00		-0.01		-0.26	
	1,078	1.20	1,079	0.36	1,079	0.35	1,079	0.07	2,315	0.68
Male	-0.03		-0.01		0.03		-0.03	*	-0.03	
	994	1.77	997	0.24	997	0.51	997	0.04	2,293	0.78
Pensioner & CSG Household	-0.29		-0.01		-0.06		-0.02		-0.55	**
	580	1.48	581	0.28	581	0.42	581	0.05	1,324	0.73
Rural	0.02		-0.03		0.02		-0.03	*	-0.17	
	1,335	1.52	1,337	0.30	1,337	0.44	1,337	0.06	2,856	0.68
Urban	-0.09		-0.05		0.02		-0.01		-0.07	
	737	1.39	739	0.30	739	0.40	739	0.06	1,754	0.82

The main ordinary least squares estimates are replicated in specific sub samples of the base sample (African and Coloured teens between the ages of fifteen and nineteen who are means test eligible for the grant in NIDS Wave 3), with various educational outcomes as the dependent variable. These are: educational deficit, calculated as the difference between the expected grade of the individual, and their actual grade; on target or ahead which is a binary variable with one indicating that the individual has either no educational deficit, or has a negative deficit (i.e. exceeding expectations in grade attainment); repeater or skipper are binary variables indicating an educational deficit which is either positive or negative respectively. Days missed is a variable measuring the number of days absent in the past month, data which is only collected for children below the age of fifteen. The four elements reported are percentage point changes and significance, mean level of the dependent variable in question, and number of observations. For example, the entire sample has 2,428 observations, the effect of receipt on the education gap is negative four percentage points, the mean education gap in this sample is 1.38 years, and this coefficient is not significant. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

We investigate the grant effect on educational deficit, calculated as the difference between the expected grade of the individual, and their current grade; on target or ahead, which is a binary variable with one indicating that the individual has either no educational deficit, or has a negative deficit (i.e. exceeding expectations in grade attainment); grade repeater or skipper, which are binary variables indicating an educational deficit which

is either positive or negative respectively; and days missed, a variable measuring the number of days absent from school in the past month, data which is only collected for children below the age of fifteen. The four elements reported are percentage point changes and significance, mean level of the dependent variable in question in that sample, and number of observations. In the top row of the table, it can be seen that the means test eligible sample has 2,072 observations, the effect of receipt on the education deficit is -0.04 years, the average education deficit in this sample is 1.48 years, and this coefficient is not significant.

Mirroring our main results in Section 6.2, we observe very little significant impact of grant receipt on these mostly cumulative educational outcomes. Receipt is seen in certain samples to have a small negative impact on the probability that a child has skipped a grade, although these effects are only significant at the ten percent level. In pensioner and grant beneficiary households, grant receipt lowers days missed by 0.55 of a day however no other significant effects are observed in this sample for the other outcomes.

The mean values of these outcomes in Table 9 reflect the discouraging state of educational attainment in South Africa. In the means test sample, the average educational deficit in the fifteen to nineteen-year-old sample is nearly 1.5 years. Only thirty percent of students are on target or ahead of grade expectations given their age, and a full forty-two percent are grade repeaters. Only six percent are grade skippers, and teens on average miss three-quarters of a day of school a month.

These tests have further confirmed the results observed previously in this section, that CSG receipt is associated with significantly higher levels of enrolment, but little to no effect on years of schooling. This implies school enrolment is not translating into real achievement. It may be that other confounding effects exist which affect the significance of the impacts found.

6.5 Confounding Effects

6.5.1 The Cumulative Effects of Grant Receipt

Many of the cash transfer programs in developing countries, such as the *Bolsa Familia* in Brazil, *PROGRESA* in Mexico, the Family Allowance Program in Honduras, the Female Secondary School Assistance Project in Bangladesh, and others, were initiated in the

1990s (Barham et al. 2013). Many children have received these transfers since birth, such as South African children born in 1998, while others received benefits for at least their early years. It is now possible to evaluate the long term impacts of cash transfer receipt in these countries, and in South Africa, and whether these transfers have resulted in significant investments in child health and schooling, as desired.

There is a need for research which evaluates the longer term impacts of these programs, on human capital levels in particular (Behrman et al. 2011, Amarante et al. 2011), a gap this paper seeks to fill. Only with time can a true assessment be made as to whether the gains in enrolment have lead to true gains in human capital achievement (Baez & Camacho 2011). If no other inputs to the education production function change, an increase in enrolment may only have negative effects if it results in overcrowding or simply an influx of lower ability students who would have been less likely to complete their schooling before the transfer was introduced (Baez & Camacho 2011). In addition, enrolment may not necessarily imply higher achievement - current attendance is far more key to achievement (Woolard & Buthelezi 2012). Transfers may be more valuable for educational attainment when provided at the ages when drop-out begins (Barham et al. 2013). Some studies exist which measure test scores (a more cumulative measure), but these are less common than those measuring attendance or enrolment (Baird, Ferreira, Özler & Woolcock 2014, Baez & Camacho 2011), and few of them find large effects (Wolf et al. 2013).

In a program evaluation ten years after an initial three years of program receipt in Nicaragua, Barham et al. (2013) observe a large, significant and persistent positive impact of cash transfer receipt on both years of schooling attained[16], and achievement scores. Other studies of programs such as the Mexican Oportunidades cash transfer system, report an increase in grades of a fifth of a year (Behrman, Parker & Todd 2005, Barham et al. 2013, Baez & Camacho 2011). A ten year evaluation of the Oportunidades uses a measure of cumulative grant receipt to estimate program impact, and finds higher cognitive scores, lower levels of behavioural issues, and higher height for age Z scores due to cumulative grant receipt in eight to ten-year-olds (Fernald, Gertler & Neufeld 2009). Using exogenous variation in program receipt duration in Colombia, Baez & Camacho (2011) find persistent positive effects of receipt on school completion, in particular for

[16]Recipients attain half a year of education more than non-recipients.

girls and beneficiaries in rural areas, but no effects on test scores.

We find a large and significant effect of potential duration of receipt on enrolment, yet no effect for years of schooling. The non-parametric estimates further support this finding of the positive effect of cumulative years of receipt on enrolment, with significant differences in enrolment observed depending on the proportion of life the child is exposed to the grant.

The instrumental variables results for the younger samples in Table 6 do show a large positive effect of duration of CSG receipt on years of schooling, although the coefficient is possibly inflated - caution be used when estimating these results. The results imply that for a sample of CSG beneficiaries, who are currently reporting duration of CSG receipt data, an extra year of receipt is associated with 1.45 years of years of schooling attained. This is a very large effect, and is not generalisable to the older teen sample necessarily. In the estimates from the General Household Survey (see Table 7), a positive impact of potential years of receipt on years of schooling can be observed: an extra ten years of receipt is associated with half a year more schooling attained. However, this effect does not accord with the IV or OLS results, implying another omitted factor may be driving those results.

That potential duration does not appear to consistently affect years of schooling for the older teen sample is an unexpected result, given the likely association between cumulative measures of receipt and cumulative outcomes such as years of schooling obtained. Despite the fact that variation in this sample in terms of potential duration does exist, it may be the case that evaluation in a slightly older sample than teens aged fifteen to nineteen is required, when all individuals in the sample are likely to have finished their schooling, and comparison in potential duration of receipt is less likely to be associated with age.

6.5.2 Exploiting the Dynamics of Enrolment

The random variation in the likelihood of receipt due to the age eligibility changes between 2010 and 2012 would suggest the use of a difference-in-differences approach as an additional identification strategy. However, the unexplained large change in enrolment from Wave 1 to Wave 3 acts as a significant confounding factor. A large dip in enrolment is seen between Wave 1 and 2, followed by a recovery to the original levels in Wave 3 (see Figure 3), with no systemic reason suspected for the change by other researchers

(Branson et al. 2013). Difference-in-difference estimates might erroneously suggest that the increase in enrolment could be attributed to grant receipt, when in fact some other exogenous change might be causing these effects. Another potential explanation may be related to the data collection in the two waves, which could possibly differ in some important way which affects the measurement of enrolment, and thus renders comparison between the two waves invalid. This is a pity as a difference-in-difference estimation does not require the comparison of the same participants across the waves, unlike individual fixed effects, another potential avenue to validate these results.

Unfortunately it is not advisable to use the panel and fixed effects to identify the grant effect on enrolment between Waves 2 and 3. Besides the unexplained variation in enrolment between the waves, the potential sample size for fixed effects is very small. Of the sample of fifteen to nineteen-year-olds in Waves 2 and 3, the fifteen and sixteen-year-olds in 2010 appear again as seventeen and eighteen-year-olds in 2012 and thus are the only potential observations in a fixed effects analysis. Approximately fifty individuals report changes in both enrolment status and CSG beneficiary status over Wave 2 and 3, which does not yield enough variation for a successful fixed effects estimation.

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6.5.3 Mother Quality and Reasons for Non-Receipt: Exploratory Analysis

If the quality of a mother's parenting is a significant factor in the child's educational outcomes, and their probability of grant receipt, this may serve as a confounding factor if not controlled for in some way in the estimation. In some preliminary analysis, the relationship between some measures of maternal attentiveness and child enrolment and grant receipt is explored. One measure for maternal "quality" is whether or not the child has a Road to Health clinic card (which records the child's growth, vaccinations and clinic visits). Data on clinic cards is only collected for children below the age of fifteen but it is possible to examine the rates of possession for the oldest teens (twelve, thirteen and fourteen-year-olds) and assume these rates of possession continue in a similar pattern in the slightly older teens used in this analysis. In Wave 3 of the NIDS, rates of possession are high: eighty-nine percent of fourteen-year-olds hold a clinic card, ninety-one percent of thirteen-year-olds, and ninety-two percent of twelve-year-olds. These rates of possession do not differ significantly for those who are or are not income eligible for

the CSG. Beneficiaries and non-beneficiaries in this sample of older children are found to have the same rate of possession of road to health cards[17]. Another measure is reported duration of receipt. Duration is not a predictor of current receipt, and its inclusion does not change the sign or size of the CSG coefficient, implying again that early CSG receipt (a sign of eagerness) does not impact on enrolment for older teens (although according to the literature it may well in the earlier years).

Reasons for non-receipt such as administrative issues, or lack of information about the process tend to be more of an issue for mothers of very young children obtaining receipt for the first time, and not for those of older children. Previous data collection (Department of Social Development 2012) shows that some incorrect beliefs are present regarding who can apply, and that lack of documentation has lowered access rates. However focus groups conducted by the Department of Social Development in 2012 seem to imply that wide spread educational campaigns to alert potential older recipients have been successful. Participants also report a large improvement in the ease of application compared to earlier years.

The stated reasons for non-receipt may also shed some light on the minimal grant effect on years of schooling observed. However, remarkably few individuals interviewed in the NIDS report their grant application being refused - only fifty-four individuals in Wave 3, forty-two in Wave 2, and sixty-nine in Wave 1. For age-eligible African and Coloured children, only eleven percent over the waves have never had anyone apply for a child support grant for them. For those who have not applied, the main reasons are split fairly evenly between lack of correct documentation and indifference (with too high costs of application, and lack of knowledge making up the remainder of significant reasons). This distribution of reasons remains fairly constant over the age distribution. This raises the question of whether it is safe to assume that recipients are no different from non-recipients. A binary variable for both these states jointly (indifference and documentation problems), and separately, are included in the enrolment regressions to determine if these are significant factors in predicting enrolment, and these variables are not found to be significant in enrolment regressions for the younger ages, nor for older teens (when using data from previous waves).

This paper has found a significant and large impact of current grant receipt on the

[17]Approximately eighty-eight percent of African and Coloured twelve to fourteen-year-olds possess a Road to Health card, and this figure does not differ significantly by beneficiary status.

enrolment of older teenagers, and minimal to no impact on years of education. We turn to a discussion of the potential mechanisms behind these effects.

7 Mechanisms of Change

Some have argued that grant receipt may increase the bargaining power of mothers (Ambler 2013, Richards, Theobald, George, Kim, Rudert, Jehan & Tolhurst 2013). The additional income may reduce a woman's reliance on spousal income, and thus improve her fall back position (Quisumbing & Maluccio 2003). There is a key reason that female grant receipt may positively impact children. Empirically, women have been seen to spend more on children's health, nutrition and education, compared to the greater spending on personal consumption observed among men, both internationally (Lundberg & Pollak 1996, Quisumbing & de La Brière 2000, Alderman, Chiappori, Haddad, Hoddinott & Kanbur 1995, Thomas 1990, Quisumbing & Maluccio 2003) and in South Africa (Case & Deaton 1998, Duflo 2003, Rogan 2013, Delany 2008, Yamauchi 2008). This effect will be stronger the lower the degree of income pooling in households. In South Africa, the income pooling hypothesis is often rejected, for both the child support grant (Delany 2008), and the old age pension (Duflo 2000). This suggests the mechanism of change is from grant receipt improving maternal bargaining power, in turn increasing the amount spent on adolescent's schooling, resulting in gains in enrolment. Mothers can impact enrolment more than years of schooling, which is more related to school quality.

Looking in the NIDS, in 2012, fifty percent of potential school-goers between the ages of fifteen and nineteen who were not enrolled in 2011 cited reasons of either not being able to afford to go to school, or current engagement in job search. A further thirteen percent cited pregnancy or having a child as the reason for non-enrolment. Only one in ten potential school-goers in Wave 3 of the NIDS do not enrol because of disinterest, and a very low percentage of those not enrolled cite current employment in 2012, or having finished education as the reason. In addition, those households in the NIDS receiving the child support grant in 2012 had equivalent schooling expenditures to non-recipient households, implying that the CSG may be instrumental in bringing these households' educational spending up to par with non-beneficiary households. Knowledge of the CSG is high among teens themselves, and adolescent awareness is an important determinant

of receipt (Department of Social Development 2012).

A question is whether the CSG can be expected to have a meaningful impact on adolescent educational success, given the relatively modest grant amount. In 2011, mean annual educational expenditure for the bottom three household income quintiles was approximately 1,350 rand (Branson et al. 2013), however, the total CSG amount received per child in that year was 3,120 rand. Total average education spending per child in the CSG means test eligible sample was even lower at 820 rand in 2011. Grant income may be large enough to have a significant effect on school enrolment if the costs of schooling are an important factor in the enrolment decision.

A quarter of twelfth-grade teenagers in Johannesburg travel further than ten kilometres to school, usually to better quality and more expensive schools than local alternatives, despite having available schools on average only 0.4 kilometres away (de Kadt, Norris, Fleisch, Richter & Alvanides 2014). The grant may be financing enrolment among older teens at better schools, by covering one aspect of school costs, namely transport[18].

A marginal effect in our results is that depression in teenagers lowers enrolment and years of schooling, although these effects are not large or consistently significant. However it is known that depression in teenagers is associated with negative effects, including educational outcomes (Baird et al. 2013, Hammen, Brennan & Le Brocque 2011). This is another mechanism through the grant may impact on educational outcomes - if the grant somehow reduces adolescent depression, this may improve educational outcomes. The grant has been seen to have some positive effect on depression (Eyal & Burns 2016), indicating this may be a channel of influence.

8 Conclusion

Adolescence has been cited as the second most important developmental period for children, second only to early childhood. Throughout the developing world, early childhood development has been recognised as crucial for the success of children in later life, and many social security programs have been put into place to provide inputs into the development of children from birth. A wide research focus, both in South Africa and in- ternationally, has been placed on the effects of cash transfer programs on the out-

[18]Transport costs made up a fifth of total education costs in 2011 (NIDS Wave 3).

comes of child beneficiaries, with a much smaller emphasis on the potential impacts on adolescent beneficiaries and their mothers. In addition, much of the literature has focused on both short term, and tangible outcomes. This paper evaluates the impact of the South African child support grant on the schooling outcomes of older adolescents, using exogenous variation in both current and cumulative receipt to identify these effects.

Beneficiaries are found to have school enrolment rates at least ten percent higher than non-beneficiaries, and these effects are even higher in certain sub-groups. Duration of receipt is also found to be an important predictor of enrolment. From survey data and anecdotal evidence, it appears that one possible channel through which the CSG affects enrolment is through the alleviation of the costs of school attendance. However, this positive improvement in school-going has not translated into higher human capital achievement. Neither current nor cumulative receipt is found to be associated with any change in years of schooling achieved. For younger children, who are already child support grant beneficiaries, a year of receipt has a large effect on years of schooling attained, but this effect cannot be generalised to older teens.

In Section 6, enrolment and years of schooling attained are the main educational outcomes of interest. Other papers have also focused on days of school missed (**?**), which is an even more current measure of educational status. In Table 9, the impact of grant receipt on days of school missed in the past month is estimated, and no significant effect is found except in pensioner households, where beneficiaries miss half a day of school less than non-beneficiaries. However, this data is only collected for individuals below the age of fifteen, thus grant receipt is possibly endogenous in the estimation. Days missed and enrolment are both self reported measures, may be subject to reporting bias. Reporting bias is likely to be less of an issue with enrolment, as this variable refers to enrolment in school in that year of study, which is unlikely to be susceptible to recall error.

Despite that no effects on human capital attainment are found, it may be the case that other cumulative effects do exist, such as an effect of improved nutrition. This is a possibility given the wide research which has found positive effects of grant receipt on the nutritional status of young children. This is a potential avenue for future research, namely the estimation of CSG receipt on other measures of welfare in this older adolescent sample.

In addition, other valid metrics of academic success do exist, besides years of schooling.

The absolute quality of academic achievement as measured by test scores, or university entrance, are other options for study. Even if the grant has not resulted in more years of schooling attained, it is possible that the quality of the years attained may be higher, which is testable given the right data.

The positive impacts of the child support grant in the short term are clear, helping to keep teens in school, at a time when drop-out becomes common. Larger increases in enrolment are usually only seen in countries with lower baseline levels of school-going, thus the size of the effects seen is noteworthy given the high initial enrolment levels among South African teens.

It may also be the case that the grant has not yet been evaluated over a long enough time span for human capital gains to manifest. In 2016, the first group of beneficiaries who received the grant from birth are coming of age. Possibly the evaluation of this group could yield significant impacts on schooling, but given the already large duration of potential receipt in the 2012 sample used in this paper, and the consistently insignificant effects observed of receipt on years of schooling in a number of different samples and specifications, this is unlikely to be the case.

The lack of conversion from enrolment benefits to human capital achievement is concerning. South Africa is not unique in this regard. These results accord with both the international and domestic literature which show transfers frequently affect enrolment, however, modest or no effects on cumulative outcomes such as test scores and years of schooling are usually found in lower and middle income countries. It is crucial to understand why this is the case. School quality is possibly the missing link in this question. School quality is important: education is more than a seat in front of a blackboard.

Appendix

A.1 Type of Receipt: Interrupted or Uninterrupted

Figure 7 graphs enrolment by nature of receipt, whether interrupted or uninterrupted. Whether receipt was interrupted or not does not appear to manifest in different levels of enrolment.

Figure 7: Predicted Enrolment by Type of Receipt

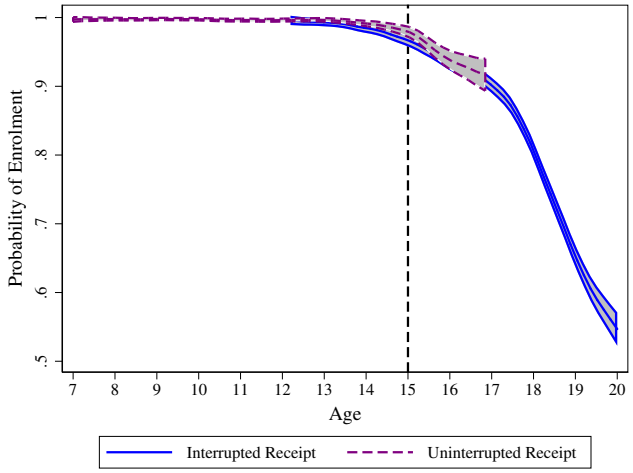

Figure 7 shows predicted enrolment as a function of age for those who have had either interrupted (born before 1995) or un-interrupted receipt, with ninety-five percent confidence intervals. The vertical line shows the legal minimum school leaving age of fifteen. Data: National Income Dynamics Survey.

A.2 Instrumental Variables Assumptions

This measure of the average treatment effect can be seen in the estimates in Table 10, which reports the first and second stage estimates for enrolment and years of schooling from Model (2). The results suggest the existence of a strong first stage - those who are age eligible are forty-three percentage points more likely to receive the grant.

Table 10: Instrumental Variables Estimates: Enrolment and Years of Schooling

Dependent Variable	Enrolment				Schooling			
	(1)		(2)		(3)		(4)	
CSG Receipt			0.17	**			0.23	
Age in Years	-0.09	***	-0.09	***	-0.08	***	0.71	***
Female	0.01		-0.04	***	0.01		0.63	***
Depressed	-0.06	***	-0.03		-0.06	***	-0.16	*
Log of HH Education Spending	0.00		0.03	***	0.00		0.13	***
Mother has a Matric	-0.06	**	0.04	**	-0.06	**	0.74	***
Years of Schooling	0.01		0.04	***				
Coloured	-0.07	*	-0.12	***	-0.07	*	0.00	
Mother Resident in HH	0.10	***	0.00		0.10	***	-0.14	*
Log of Household Income	-0.01		-0.01		-0.01		0.13	***
Household Size	0.00		0.00		0.00		-0.05	***
Rural	0.02		0.01		0.03		-0.11	
Age Eligibility	0.43	***			0.43	***		
Dependent Variable Mean	0.81				8.76			
Number of Observations	2,071		2,071		2,076		2,076	
F stat	103		25.6		108		71.8	
Adjusted R-squared	0.44		0.23		0.44		0.34	
Stage	1st		2nd		1st		2nd	

This table reports the results of instrumental variables estimations predicting the impact of CSG receipt on enrolment and years of schooling. Age eligibility is used as an instrument for actual receipt, with the first stage results presented in Columns (1) and (3). The sample used is that of African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant. A full set of province indicators is included in each specification. Robust standard errors are calculated, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

A valid instrumental variables (IV) strategy also requires an exclusion restriction to hold, which is that the instrument is randomly assigned, i.e. $Cov(Elig_i, u_i) = 0$. The assumption in this analysis is that of conditional random assignment, i.e. after

controlling for age in the fifteen to nineteen-year-old sample, eligibility is exogenous. The assumption is that assignment to treatment is random, conditional on age. It is necessary to account for age differences in enrolment, in particular the downward trend in enrolment for older children. In Wave 3, due to the staggered roll-out of the grant to older teens, age eligibility is conceivably random (particularly because the eligibility variable - age - cannot be manipulated).

The exclusion restriction for heterogeneous treatment effects presupposes that there is one unique channel through which eligibility operates on enrolment. Were the instrumental variables results to be examined around the age of fifteen, it would not be possible to attribute any changes in enrolment conclusively to changes in grant receipt, as a large drop-off in enrolment is expected at the age when teens are legally allowed to leave school for the first time. Fortunately the grant age threshold of eighteen in 2012 is sufficiently far from the minimum compulsory school leaving age of fifteen, implying the two effects of grant receipt and being legally allowed to leave school ought not to be related. Moreover, a major drop in enrolment does *not* occur immediately after the age of fifteen, but rather occurs after the age limit for the grant is reached (See Figure 3), thus further ruling out this potentially confounding effect. In addition, the coefficients are similar in size and significance in the instrumental variables estimates if other variables are included or excluded, which provides further evidence to imply the instrument is acting through only one channel.

For the monotonicity condition, which requires that no individual is excluded from grant receipt by being age-eligible, we require that the instrument works in only one direction: eligibility only serves to raise the probability of receipt, and never to reduce it. This is a trivial assumption given the CSG allocation rules (Angrist & Pischke 2008).

If these three assumptions are met, the IV coefficient can be interpreted as the local average treatment effect (LATE). This is the causal effect of grant receipt on those who do respond to age eligibility by ensuring they receive the grant, with certainty (Angrist & Pischke 2008). In addition, if the instrumental variable is defined such that it rules out the existence of either "always takers" or "never takers" (always takers access the grant no matter their age eligibility status, and never takers never take the "treatment" - the grant - no matter their age eligibility status) then the local average treatment effect can also be interpreted as the average treatment effect (Angrist & Pischke 2008). Due to the

systems used by SASSA to implement distribution of the grant, there cannot be what Angrist & Pischke (2008) refer to as "always takers" for the CSG.

Age ineligibility precludes receipt with certainty. Thus the LATE is also the average treatment effect (ATE) on the treated, assuming this effect is homogeneous (Angrist & Pischke 2008), as the ATE is a weighted average of the effects on always takers and compliers, and there are no always takers). This fact supports the external validity of these results.

A.3 Sub-Sample Analysis: Instrumental Variables

The literature suggests that differences may exist in the grant effect in certain sub-groups. Specification (2), the results of which are seen in Columns (2) and (5) in Table 4, is re-estimated for different sub-samples, and the results are shown in Table 11. The top line in this table corresponds to the IV coefficients in the second and fifth columns of Table 4. The results from the identical sample analysis using the instrumental variables estimates are quantitatively similar, although larger. The means test eligible sample (African and Coloured teenagers between the ages of fifteen and nineteen who are means test eligible for the grant) is the same as that used in Table 4. The four numbers reported are the increase in enrolment related to grant receipt, the significance level, the mean of the dependent variable in the sample (mean enrolment or years of schooling), and the number of observations in that sample.

Table 11: Instrumental Variables Analysis in Selected Sub-Samples

Samples	Enrolment		Years of Schooling	
Means Test Eligible	0.17	**	0.23	
Mean, Sample Size	0.81	2,071	8.76	2,076
All	0.20	***	0.15	
(Means Test Eligible and In-Eligible)	0.82	2,429	8.86	2,434
Coloured	0.05		0.34	
	0.63	259	8.83	259
African	0.18	***	0.21	
	0.84	1,812	8.75	1,817
Female	0.15	*	0.81	**
	0.80	1,076	9.07	1,079
16 and 17 Year Olds	0.00		0.00	
	0.89	857	8.51	859
Pensioner Household	0.19	*	0.40	
	0.83	579	8.73	581
Rural	0.16	**	-0.02	
	0.84	1,333	8.68	1,337
Urban	0.19		0.76	
	0.76	738	8.92	739

The main ordinary least squares estimates of grant receipt impact on enrolment and years of schooling are replicated in specific sub samples of the base sample (African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant). We use Specification (2) - CSG receipt is instrumented for using age eligibility.The four elements reported are percentage point changes and significance, mean level of enrolment or education, and number of observations. For example, the entire sample has 2,071 observations, the effect of receipt on enrolment is seventeen percentage points, the mean level of enrolment in this sample is eighty-one percent, and this coefficient is significant at the five percent level. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

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SALDRU

Southern Africa Labour and Development Research Unit

The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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